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THE MICRO USER

Volume 1
Number 6
August 1983
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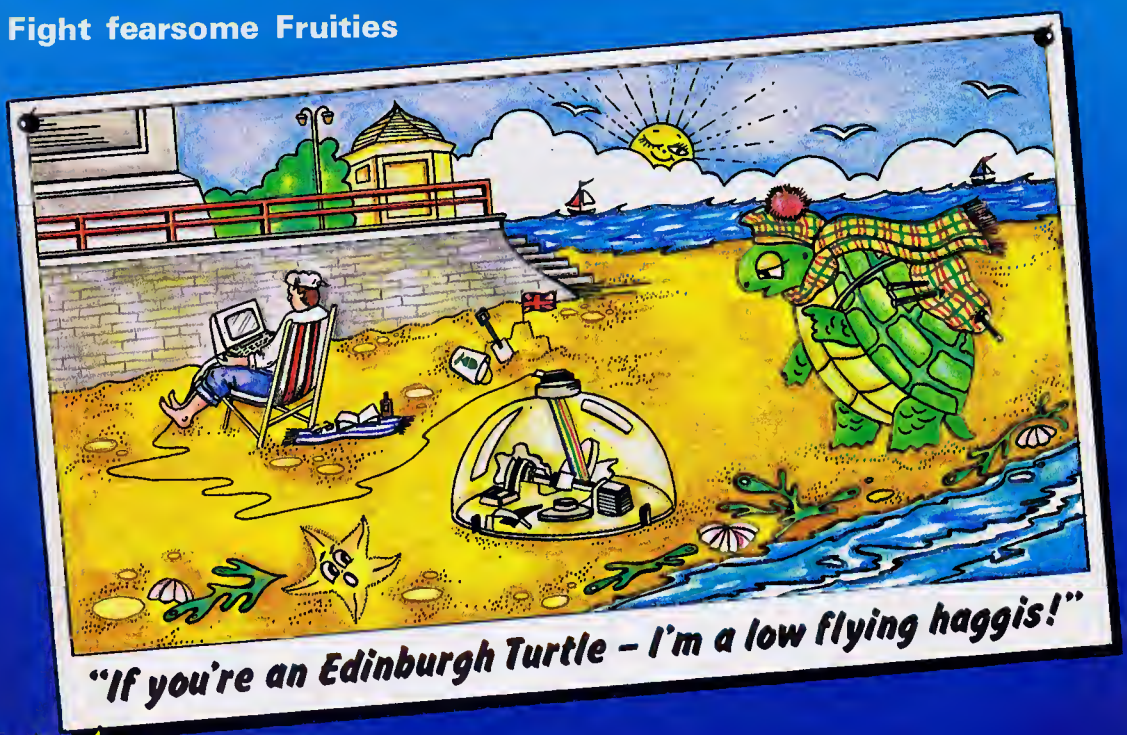

"If you're an Edinburgh Turtle – I'm a low flying haggis!"

INSIDE
Pull-out Guide to software for the BBC Micro Part 3

TALKING TURTLES!

We put two rival BBC robots through their paces – Page 26

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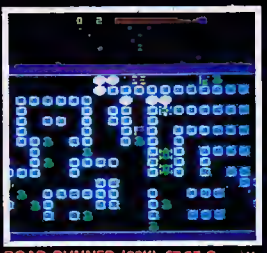

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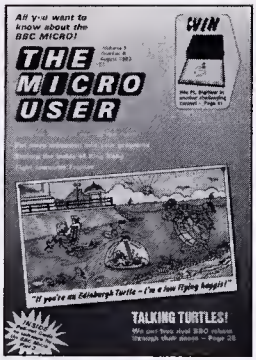

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The Micro User welcomes program listings and articles for publication. Material should be typed or computer-printed, and preferably double-spaced. Program listings should be accompanied by cassette tape or disc. Please enclose a stamped, self-addressed envelope, otherwise the return of material cannot be guaranteed. Contributions accepted for publication will be on an all-rights basis.

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CONTENTS

NEWS 9
Keep in touch with the latest happenings in the bustling world of the BBC Micro.

ANIMATION 16
Put more action into your programs with the first part of our new series on animation.

SCHOOL 22
The classroom where the children use a BBC Micro as naturally as they would a crayon.

TURTLES 26
We review two of the new breed of robots that can be harnessed to the BBC Micro.

TAPE TO DISC 30
Uploading your programs from tape to disc is simplicity itself with these techniques.

SOFTWARE 35
Our reviewers give frank appraisals of the latest in both games and business software.

STRUCTURE 39
Keep control of your programs by eradicating GOTOs. We show you how simple it can be.

COMPETITION 41
Write a program to animate a high diver and you could win yourself a graphics digitiser.

INSIDE KING KONG 42
We revisit one of our most popular games for a case study in structured programming.

TAPE OFFER 51
Save yourself the chore of keying in programs from this issue with this month's cassette.

INSIDE this issue

54 FRUITIES
How long can you survive the terrors that await you in the garden of unearthly frights?

55 DIRECTORY
The third part of our pull-out guide to more than 400 BBC Micro software programs.

63 BACK ISSUES
Find out about the features you missed in the last five issues of The Micro User.

66 LOGICAL OPERATORS
A simple guide to the not so simple use of AND,OR and EOR in conditional statements.

70 MODE 7 COLOUR
We present useful machine code routines to bring superb vivid colour to your screens.

72 SUBSCRIBE NOW
A year's subscription to The Micro User will bring you a FREE copy-holder and crib sheet.

79 UPGRADE
Control the world with your BBC Micro. This month we link up with a dual cassette system.

88 TUTORIAL
We learn more about loops and the use of conditions in part six of our beginners' course.

105 MICROMAIL
The pages you write yourself – just a small selection from the letters that are flooding in.

108 MISSIVE
Our intrepid hero Bob is caught doing despicable things with his GOTO.

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And yet, with all these advanced features, the Spark-Jet costs only £365.

THE ACORN SPARK-JET PRINTER

Not only that, but you also receive a free program on cassette that enables you to 'dump' graphics from either monitor or TV.

If you're interested in joining the jet set, simply call in at one of the dealers listed below. He'll tell you everything you need to know.

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MU8

THE MICRO USER
August 1983
NEWS

BBC MICRO USER SHOW SPECIAL

The crowds gather . . . round the big Acorn stand

Micro User Show draws 12,500 fans

BBC Micro enthusiasts from all over Britain flooded to the first BBC Micro User Show held recently in Manchester. Attendance was high throughout the three day event, and when the show finally closed more than 12,500 BBC Micro fans had passed through the doors.

Kitemark accolade

THE BBC Micro has been selected by the Design Council of Great Britain for the Design Centre.

It is only the second computer allowed to bear the famous Kitemark (the Sinclair ZX81 was chosen in 1981).

With more than 50 companies represented, visitors to the show could find every conceivable product for the BBC Micro – many of which were on display to the public for the first time.

Among the new launches were Cumana's Z80 based second processor, and their new range of slimline disc drives.

Not to be outdone, Watford Electronics unveiled four products that created much interest.

These were a 13 ROM socket board, a 16k disc filing system, a graphics plotter and an EPROM programmer/emulator.

New software included a range of games from Kay Dee Software, a data graphics package from Gemini and a ROM based spreadsheet program from Computer Concepts.

Pace's new DFS for the BBC Micro attracted considerable attention.

Queries

Visitors were also able to pick up much useful information about the BBC Micro.

The Acorn stand handled many queries from users as did *The Micro User's* own technical information stand.

Many hundreds of people took the opportunity to discuss their programming problems with the experts.

In addition, the show featured a "walk in forum", in which well-known names from *The Micro User* team of writers gave talks on every aspect of BBC Micro lore.

Subjects ranged from using it in the infants' classroom to interfacing it with mainframe computers.

Each day visitors were invited to quiz speakers in several lively Any Questions sessions.

Acorn – offering Econet, promises and policies

LARGEST stand at the BBC Micro User Show was taken, not surprisingly, by Acorn. However, they weren't there to sell, but to disseminate information.

Said regional manager Joe Black: "We're here to demonstrate our software, the second processors and to show the Econet system in full cry.

"We also need to be at the show to give the public policy decisions and statements that our dealers might not be in a position to give – for example on delivery dates.

"We are now fairly confident that we are giving people the right answers. Most enquirers leave the stand satisfied.

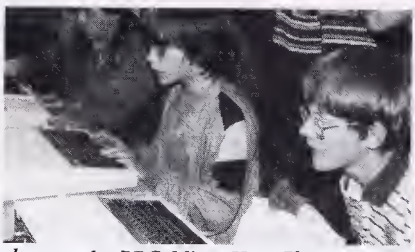
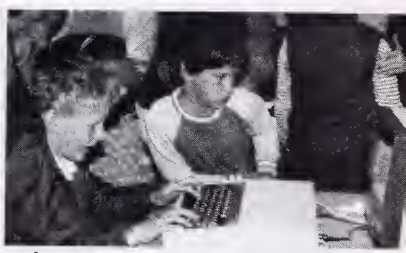
Delighted

"In fact, a number of people have come onto the stand simply to say they are absolutely delighted with the BBC Micro – and that makes us absolutely delighted as well."

Joe confirmed that the 6502 and Z80 second processors will definitely be available in September.

"They are being produced in quantities at this moment," he said.

BOOTS DROP MICRO BOMBSHELL – See Page 14

They came in their thousands . . . the BBC Micro User Show was a sea of faces, rapt, enquiring, wondering . . .

Starsoft was watching you . .

VISITORS to the Starsoft stand at the BBC Micro User Show made a significant contribution to the company's software development – although they didn't realise it.

"As a result we got a lot more than just sales and publicity," said one of the company's programmers.

A sophisticated database program was in operation while the company's educational programs were being demonstrated.

Improve

It analysed the input or response to the programs from the stand visitors. The results will be used to help modify and improve programs.

"I'll be able to find out whether the programs run too fast, or whether the interactive questions are easily understood or relevant," he said.

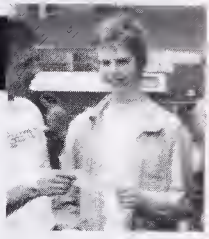
Understand

"For example one program asked the user to respond 'Red, Green, Yellow or Hit Any Key Twice' and no one seemed to understand the last option."

Starsoft only exhibited on the last two days of the show. They said the response had been fantastic – far better than expected.

"I had thought it would be boring – but now I am converted and if Micro User holds another show, we will be there," he said.

ROYALTIES START AT 17



SCHOOLBOY Nicholas Tingle, 17, received a cheque for £2,000 at the BBC Micro User Show. The money was an advance royalty payment for an arcade game written by Nicholas for the BBC Micro.

The managing director of Gemini Marketing, Dale Hubbard, pictured left, handing the cheque to Nicholas, used the occasion to finalise contracts for the royalty arrangement.

Nicholas is studying for his chemistry, mathematics and physics A levels at Bishop Vesey School, Sutton Coldfield.

He developed his programming skills at home and bought his first computer, a Sinclair ZX81, about four years ago, upgrading to a BBC Micro a year ago.

It took him two months to complete Missile Control, which is written entirely in machine code. It will be one of six games titles launched by a Gemini subsidiary, Supernova Software, next month.

The Micro User's technical adviee stand did a roaring trade answering questions from visitors. Manning the stand were many of the writers from the pages of the magazine.

Funny things happened at the forum

HIGHSPOT of the BBC Micro User Show was for many visitors the walk-in forum.

Friday's sessions were devoted to the use of the BBC Micro in education, with great emphasis on practice rather than theory.

Star of the show was diminutive Wyn Moore, headmistress of a Bradford school. Her description of how the BBC Micro came into the life of her school gave her audience a great deal of useful advice in a thoroughly entertaining manner.

Equally practical was Don Fuller's talk on designing educational software.

The weekend's talks catered for the general BBC Micro user. Mike Cook's lecture on interfacing demonstrated that he could talk as humorously and informatively as he can write.

He also produced the definitive single board computer. He built it on a piece of wood!

Fellow *Micro User* writer Paul Leman created tremendous interest with a series of demonstrations of animated graphics.

Hardest worked writer of the weekend was Paul Beverley, who entertained the audience with no less than seven lectures on various aspects of machine code on the BBC Micro.

On both the Saturday and Sunday the speakers joined forces to present Any Questions? where they faced a barrage of queries from BBC Micro enthusiasts.

The interchanges were lively and often extremely humorous, with the audience playing as great a part as the panel.

Said one expert: "I think we learned as much from the audience as they did from us."

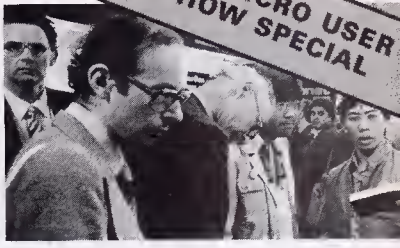
CHIPS WENT APACE..

A DEALER order for more than 1,000 DFS chips a month and others for 100 a month were taken by Pace Systems of Sheffield.

The company sold out of virtually all its show stock, including more than 200 disc drive units, some of them twin drives costing more than £700.

"It was a very competitive show and the quality of people visiting our stand was high," said David Hood of Pace. "We had seven staff on the stand and for most of the three days had people queuing up to speak to them.

"It was our first show, and we had no idea we would do so well."



all swept up in the exciting world of the BBC Micro

INTO THE REAL WORLD OF INSTRUMENTATION

"BBC Basic has at last entered the real world of control and instrumentation", said Dave Hunt, technical director of Cube Computers, commenting on the Micro User Show launch of the Eurocube.

The product is unique among single board computers in that it can run BBC Basic.

Said Hunt: "You can develop programs either in assembler or BBC Basic on the BBC Micro. Then, using our sideways ROM utility called Terminal, you can load it into Eurocube which then acts as a stand alone computer."

Dedicated

"We buy our Basic ROM from Acorn. It gives the user all the advantages of BBC Basic without having to tie up the more costly BBC Micro as a dedicated computer."

Also released by Control Universal was Beeb-Ex, an interface card which is attached to the BBC Micro 1mHz bus port by a 34-way ribbon connector.

Beeb-Ex runs the complete Cube range of 30 Eurocards produced by Control Universal, as well as the Acorn Eurocards.

A spokesman said it is difficult to choose a "typical" application for Beeb-Ex, but most likely passengers on the bus would be 64/80 channel digital I/O, 8 or 12-bit analog interfaces and extra memory.

256 bytes of memory are addressed directly, but up to 1mbyte may be addressed in page mode.

This capability offers the possibility of a "silicon disc" (or "virtual disc") of battery-backed CMOS RAM, or up to 1mbyte of paged DRAM.

A second permutation of extension products could include the battery-backed real time calendar clock, additional independent video outputs, heavy duty industrial switch outputs and additional independent serial I/O.

Beeb-Ex is available in two versions. A stand-alone unit which holds up to four other Eurocard devices by their edge connectors, costs £49.

The second type is designed for more ambitious applications, slotting into a standard rack-mounted system of up to 14 backplane connectors. It costs £41 for the interface, with racks from £72.

Data transfer along the 1mhz bus is achieved by using "Fred" and "Jim", the two special pages of the BBC's MOS (Machine Operating System) which control memory mapped I/O.

GAMES RANGE LAUNCHED

LATEST entrant to the field of BBC Micro games software is Kay Dee Software. They chose the BBC Micro User Show to launch a quartet of attractively packaged games.

Pass-Go, based on a familiar board game, is described as a "property game of strategy".

Star-Maze II is a three-dimensional maze game, while Devil's Causeway marks Kay Dee's entry into the world of adventure games.

The last of the quartet, Connect 4, has appeared in a previous incarnation as a game from Database Software.

Forth disc

ACORNSOFT continue to maintain the policy of releasing not only arcade games, but more serious software.

Just released on disc is Forth for the BBC Micro. The package consists of a Forth dictionary and compiler, an editor, assembler and high resolution graphics demonstration.

GETTING TO KNOW YOU

A FIRM specialising in educational programs, Walcam, weren't expecting on-the-spot sales and brought no stock to sell.

But a spokesman said: "We've been able to show what our programs can do and teachers can now go away and try to get a budget to buy them.

"However, we think it has been worthwhile. We have certainly made some good contacts with people in the right places".

★ ★ ★

MANY firms used the show purely to get themselves known. One was Rikadenki Mitsui Electronics, who had three new plotters on display.

"They aren't actually in stock yet and we couldn't have supplied them if there had been orders", said a spokesman. "We were looking for – and think we will achieve – longer term benefits".

★ ★ ★

THE show was fantastic – "especially in terms of getting our company known" – said Brian Howarth of Digital Fantasia.

"One of our problems has been that competitors, such as Acornsoft, have much greater marketing resources than us. This show has helped us redress the balance".

★ ★ ★

Sunday was a day of clear profit for Squirrel Software, whose takings on the first two days of the exhibition more than covered its costs.

"We have had a fantastic response said managing director Alan Turner.

Now we're taking our big show out to the users!

THE first-ever BBC Micro Users Show was such an outstanding success that many people have asked if it could visit other parts of the country.

As a result the organisers, Database Publications, have agreed to take the Show on a round-Britain tour, visiting all the major regional centres.

The first stopping point will be the Midlands on Friday, Saturday and Sunday, September 16 to 18. The venue will be the plush Sherwood Rooms in Nottingham.

Then, in December, the Show goes to London. It will take over the Westminster Exhibition Centre during the weekend of December 9 to 11.

Said a Show spokesman: "We want users everywhere to find out how they can really make the most of the BBC Micro – and try out for themselves all the exciting accessories that are becoming available.

"By taking the Show on tour we shall be giving everyone an opportunity to keep bang up to date with all the tremendous developments now taking place."

● *There will be a special discount off the admission price for party bookings.*

For details write: Group Bookings, Micro User Show, Europa House, 68 Chester Road, Hazel Grove, Stockport SK7 5NY.

Or phone Linda Dobson on 061-456 8353.

Acorn's distribution goes regional

A MAJOR reorganisation is underway at Acorn which could move the company from its current production-led orientation to place more emphasis on the sales side.

It includes a major restructuring of the company's UK distribution network with the appointment of a series of regional distributors, plus new management appointments that reflect the success of the BBC Micro and its expansion into world markets.

The end result could be a much more efficient back-up and service for BBC Micro users.

Until now there have been two distributor networks, one run by Acorn itself and the other by Leasalink Viewdata.

Under the new plan – still to be confirmed by Acorn – the distributorships will be put on a more localised basis.

Three distributors have already been appointed, subject to final contract – Micro Management at Ipswich, Eltec at Bradford, and HCCS, Gateshead.

They will take over many of the functions currently handled by Acorn and eventually will be responsible for training new dealers.

Buffer

Once adequate facilities have been established they will also handle "a certain element" of repair work and in general act as a buffer between Acorn and its dealers.

Joe Black, Acorn's regional sales manager, told *Micro User:* "The whole idea of having a centrally located distributor in a region is that hopefully the buck will stop with him and the need for people to deal directly with us should fall away.

"The distributor will shoulder much of the burden of providing customer support".

Black admitted that at present Acorn receives thousands of requests for help and guidance each month, and doesn't deal with them as it should.

Now he expects the situation to improve.

LVL doesn't appear too perturbed. It already services its dealers direct without having to trouble Acorn, and has developed a strong national distribution chain.

It is likely that this will be left unchanged except where there is a conflict between LVL's network and the new regional concept.

A conference between LVL and top Acorn management and directors is planned to iron out the details.

Roy Griffin, joint managing director of LVL, said the regionalisation plans wouldn't affect his company's terms of reference or operation.

"We work closely with Acorn and have done everything we have been asked to do as well as a lot more that Acorn hasn't got around to doing," he said.

"The new plans should lead to a much more orderly marketplace – and hopefully will mean that unpleasant problems that trouble other manufacturers, such as price cutting, can be avoided".

Palette produces colours galore

ONE of the most exciting launches at the Micro User Show was the Chameleon Colour Palette.

Produced by Wilmslow Micro Centre, it allows the user to produce spectacular new colours on the BBC Micro.

Instead of being restricted to garish primary and secondary colours, it offers alternative palettes of eight colours from a range of 4,096 shades, allowing for far greater realism in graphic displays.

The Chameleon's software not only allows the user to mix the exact shade required, but also allows him to pick two extremes of a colour range which the Chameleon then fills in.

Having chosen a colour, its brightness, saturation and hue can then be varied until the user's exact requirements are met.

Said general manager of Wilmslow Micro Centre Roger Ambrose: "We anticipated a fair amount of interest in the Chameleon. As it was we were swamped."

The Chameleon is at present restricted to colour monitors. A UHF version which can be used on domestic TVs will be available shortly.

Extra prize in disc drive contest

IN the May issue of *The Micro User* the closing date for the competition was incorrectly printed as June 30, instead of May 30. The prize awarded last month was based on entries received up to May 30.

However, *all* the entries submitted for the contest have now been judged and Cumana have very generously donated an additional 40-track 100k drive, together with its connecting cable and a book, Using Floppy Disks with the BBC Microcomputer.

It has been awarded to Ian Tresman of Elstree, Herts.

Join the MUGs!

THE Micro User team have been overwhelmed by the response to the formation of Micro User Groups – MUGs for short – dedicated solely to the BBC Micro.

People from nine to ninety have been writing in to find out more about their local MUGs, and many have offered to lend a helping hand to get them started.

In addition many well established local groups are joining up with MUGs.

If you aren't already a member of a user group you should be – you're missing out on a lot of fun and info.

If you do belong to a group, why not get it to affiliate with MUGs and take advantage of the many benefits the network can bring you?

So, if you're interested in getting in touch with your local Micro User Group, or could help in setting one up, why not fill in the coupon below and let us know?

SEND TODAY!

☐ *I would like to become a member of of my local Micro User Group.*

☐ *I would like to help in setting up a local Micro User Group.*

Name .....

Address .....

.....

.....

Phone No .....

POST TO: MUG, Micro User, Europa House, 68 Chester Road, Hazel Grove, Stockport SK7 5NY.

ECONET ON THREE LEVELS

THREE levels of Econet are now available.

Level one is a slimmed down version of Econet, using a disc-backed model B as file server and simplified software.

Level two, available at the end of September, uses a model B with 6502 second processor. Its software provides a full implementation of Econet.

Level one users will be able to upgrade to level two simply by purchasing the second processor together with the required software.

Level three is the original version of Econet using Acorn's System 3,4 or 5. This will be phased out as the other two versions begin to come on stream.

SINCLAIR'S SALES SWITCH

SINCLAIR Research, maker of the ZX Spectrum, seems to have conceded the UK educational market to the BBC Micro and is now trying to boost sales of its educational software by releasing it to the general public.

Special software was commissioned by the Department of Education and Science for use with the three micros recommended under the government's "Micros in Primaries" scheme – the BBC Model B, the Research Machines 480Z and the Spectrum.

More than 80 per cent of schools have opted for the BBC Micro.

Mrs Thatcher . . . no stranger to the BBC Micro herself. Staff from Salford University accompanying her are (left to right) Professor John Ashworth, vice chancellor of Salford University, Dr Brian James, Professor Graham Ashworth and Dr Graham Keeler

PM's biography goes on Beeb

WRITING an official biography of the Prime Minister may have been possible without actually meeting and speaking to Mrs Thatcher but it wasn't possible without the use of a BBC Micro.

The book, "Margaret Thatcher – Woman, Mother, Politician", was serialised recently in the *Daily Express* and is to be published on October 13, Mrs Thatcher's birthday.

It was written by freelance journalist Penny Junor who combined her research and writing with a full-time job as an investigative reporter with Channel Four Television's "For What It's Worth" programme.

"I started the book and the television contract last September. Both jobs were really full-time and I had to complete the book by last May. Finding the time to write was a problem," said Penny.

She did most of the research for the biography and then found a six-week gap during the TV series to do the writing.

Penny Junor . . "I'm sold on using the BBC Micro"

"I was persuaded that I'd be able to work much faster if I used a word processor, and a friend suggested that a BBC Micro would do the job."

Penny was one of the lucky people who actually managed to get a disc drive from Acorn.

Her system consists of a BBC Micro, Wordwise, the Acorn disc drive and a Brother printer.

"No disc drives were available at the time but Acorn opened up their factory to get one out when they heard whose biography I was writing," she said.

It took Penny just a morning to learn how to use the machine but she admits she still hasn't had time to read the User Guide.

Had she done so, she says she probably might have avoided the one major catastrophe she's had with the machine to date.

Transfer

"At about 1am one morning I lost 4,000 words. I hadn't formatted a spare disc, and when I tried to transfer my work to disc 1 was told my data disc was full.

"Stupidly, because I hadn't had time to read the manual, I tried to format a disc and lost the 4,000 words in the process."

There was another minor irritation with Wordwise. It required the help of a programmer friend to enable her to incorporate exclamation marks and paragraphs in her text.

Then when the work was finally completed Penny had problems trying to get her printer to work with the BBC Micro.

Despite that, she told *Micro User:* "Now I am sold on it – although the memory capacity of 4,000 words is restricting when writing an 80,000-word book.

"My children, of course, spend most of their day on it, both with games and programming."

Much of the material for the book is based on conversations with people who knew or know Mrs Thatcher.

Penny says that a simple interview with Mrs Thatcher herself would have been too short and perhaps not as revealing as talking to others.

Penny has an electric typewriter but seldom uses it. She employs the micro for writing scripts and "anything else".

It's the micro road show

A BUS-load of BBC Micros has been doing the rounds at 10 Downing Street and Buckingham Palace.

The double decker bus, flagship of Salford University's micro roadshow program (see the May *Micro User),* proved so interesting that Mrs Thatcher, who had invited it to the capital, extended her scheduled 15 minute visit to 50 minutes.

After that the bus went to the Palace where the Duke of Edinburgh, who is chancellor of Salford University, "toured" both decks.

On show was a simulation of a typical schools visit with 12 BBC Micros on the bottom deck running various physics teaching programs, and on the top deck six BBC Micros linked together under Acorn's Econet system.

The Salford double decker has also attracted attention from the Mediterranean. The *Micro User* offices received a telex from Mr Alex Axarlis, sole distributor of the BBC Micro in Greece, who wants the roadshow to visit Athens.

Roger Moss, one of the organisers, is enthusiastic about the idea.

Way out

AN exciting new service is being developed for adventure program addicts. If they're lost in a maze or trapped in a dungeon and they can't get out a software company in Harpenden is offering to help them.

Adventure-Zone Software, a mail-order firm which specialises in adventure games, plans to act as a forum for adventurers where they can swap ideas, hints and tips.

Micro has a word for it

HOT on the heels of the speech synthesiser chip comes a device which allows the BBC Micro to store human speech on disc.

The Voxbox Voice Digitiser converts the sound of the human voice into a series of "0"s and "1"s which can then be stored as disc files.

Users can build up voice files of words and phrases and then access them from their own programs.

Multiplex Computer Services who make the Digitiser claim that the reconstituted speech quality is good with no loss of stress or intonation. They see it as particularly useful for such tasks as language learning, pronunciation and spelling.

BOOTS TO SELL BBC MICRO

BBC dealers reacted as if a bombshell had struck them when Boots the chemists revealed they planned to start selling BBC Micros "within the next couple of months."

The chain already sells a range of five cheaper home computers in 180 of its branches.

They say the BBC Micro will only be sold at 30 of its main stores in major city centres.

But many worried dealers told *Micro User* they fear this could be the start of a price cutting war, with High Street stores putting smaller dealers out of business.

Some are concerned that the user will suffer with stores unable to offer the support and service provided by the independent dealers.

However Boots say they will not sell cut-price BBC machines and stress that they will be sold by trained staff.

Says Anton Boyes, in charge of Boots micro retailing: "We aren't in the business to cut prices – it is our experience that it is the smaller dealer who cuts them.

"Acorn needs to expand the market and the only way it can do that is to bring in the multiples.

Expand

'Our presence will guarantee a larger base of users.

"And as a result the market for peripherals and software will continue to expand", he said.

Boots hope to gain quite a chunk of that peripheral market.

They have been selling 24 software packages for the BBC Micro for some months.

Now they plan to start selling Acorn disc drives and cassette recorders.

Many dealers are caught between creating a good public image for Acorn and their own personal feelings.

Paul Vaughan, of Broadway Electronics, said: "The dealers have supported the BBC product from day one on extremely low margins.

"For them to see their slice of the market eroded by the multiple stores seems to me to be extremely disloyal on Acorn's side.

"For some time now most dealers have found that when they place an order for BBC Micros only a quarter is ever supplied.

"When we see more dealers, such as Boots with its 30 outlets coming on board we think that the small quantity of machines we are actually being supplied with will be eroded further.

"It isn't in the public's best interest to have a product the quality of the BBC Micro sold in the High Street shops, no matter how professional they might be.

"I'm very worried that if Acorn doesn't keep its act together – based on the dealer providing good service – the Japanese will come in with the right product at the right price and provide serious competition."

A man with a foot in each camp is Michael Jardine, who runs both Leasalink Viewdata, Acorn's main distributor, and Oakleaf Computers, a BBC dealership.

Stimulating

"By the end of 1984 most multiples will be selling micros, and doing it properly with properly trained staff," he said.

He thought their presence could help dealers by stimulating the market.

However it would also mean that to survive dealers would have to improve their standards and provide a better service.

Jardine said the casualties could be the very small companies who didn't have the capital to market themselves properly or the business experience to develop on a sound footing.

He calls them "the computer people without business sense and experience."

Policy

Joe Black, Acorn's regional sales manager, said the company's pricing policy would not change.

Boots would become a dealer and their discount structure would be the same as the existing dealer network's.

He added: "What they sell the machines for is entirely up to them however."

LEFT HANDED INPUT

A LEFT-handed graphics input device for use in computer aided learning and design has been developed by Academic Software.

It is a version of the Cad-get, the company's graphics entry tablet which incorporates a jointed arm potentiometer device with twin pushbutton control.

Each tablet costs £70 and is said to be individually calibrated using computer based iterative bit mapping to ensure accuracy of performance.

Also available is the Cadstick, a joystick with alternative double thumbwheel control for precise vertical and horizontal lines which also uses twin pushbuttons to direct the move and plot options.

The menu options for both devices include erase, redraw, text, trace, full line/dotted line, rectangle, arc/circle, polygon, fill/draw, background and foreground colour selection.

BARRY WOOD'S TAILPIECE

A RUMOUR circulating in the bar at the Micro User Show has it that Acorn are so fed up with people ripping off their software that they're going to release a new kind of game.

All you get for your money is a unmarked cassette in a plain brown wrapper.

The actual game itself is trivial.

The pleasure comes from figuring out how to copy it.

★ ★ ★

TALKING about the show, did anyone else notice the exceptionally heavy traffic between the stands selling ROM based software and the stands selling EPROMs?

I was shocked.

★ ★ ★

WELL, no one managed to spot me at the show, but I was there all right.

High point of the weekend for me was the free-for-all Any Questions? session.

It was delightful watching our beloved editor squirm as his experts blithely expounded on how to rip off protected software.

★ ★ ★

SO Uncle Clive is releasing the MEP software to the general public, is he?

It couldn't be that since the Spectrum lost out so badly to the BBC Micro in the educational market he's trying to get in by the back door?

Or could it?

I can see it now – macintoshed men standing outside primary schools hissing: "Pssst! Want to buy some educational software?"

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Speech Synthesizer	£44.00
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Seikosha GP 250 X	£276.00

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12 month "no quibble" warranty on all products

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Sanyo DR101	£44.85
Elftone	£32.20
Koyo M8150 mini	£24.15
Official BBC cassette recorder	£29.95 ★ STAR BUY

Word Processing

BBC Model B, VIEW, Silver Reed daisywheel, disc drive, disc interface all leads and manuals £1,199

Books

Complete range of books including:

Advanced 6502 Interfacing	£11.00
Programming the 6502	£9.95
6502 Software Design	£11.50
Programming and Interfacing the 6502	£14.40
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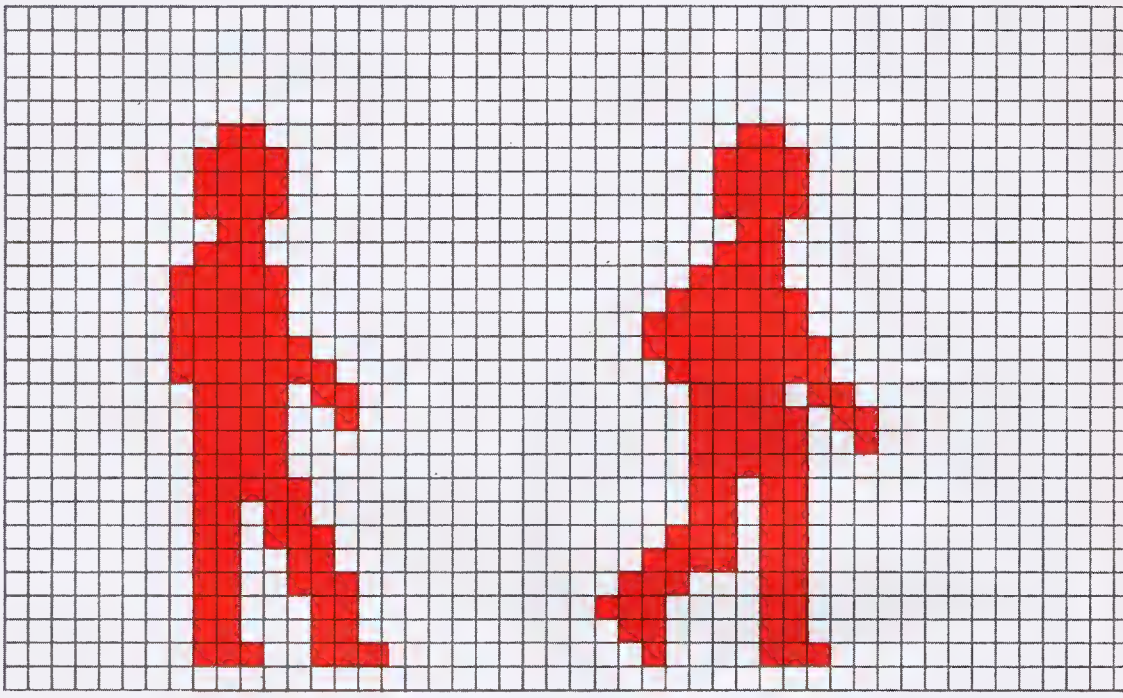


Figure 1

ANIMATION can greatly enhance a program. It can, for example, be used to clarify how sorting algorithms operate, explain how Basic statements are executed, or even used for fun.

Probably the easiest form of animation on the BBC Micro is character animation. This is where objects are moved around the screen by printing redefined characters or using the standard character set.

Printing a character or group of characters is faster than displaying the equivalent form using PLOT commands. As I mentioned in my article in the April issue of *Micro User*, Mode 7 printing is faster still.

However, given this there are two ways that we can use PRINT to animate.

- Using the default text character option. Text characters overwrite what is already on the screen so that the background in the 8x8 bit cell removes any trace of a previous character.

This can give very smooth animation effects, but is limited to the use of simple background and foreground colours.

Characters can be speedily placed anywhere in the text positions available for the current mode by the use of TAB(X%, Y%).

- Graphic printing with the cursors joined by VDU 5. Graphics characters are mapped onto the screen by the logical operation specified by GCOL. This gives access to the more exotic facilities such as foreground/mid-ground/background effects that will be discussed in a later article.

Characters can be placed anywhere on the graphics screen by the use of MOVE X%, Y%.

Both methods, however, require careful planning and a little graphic skill to produce an effective animated sequence.

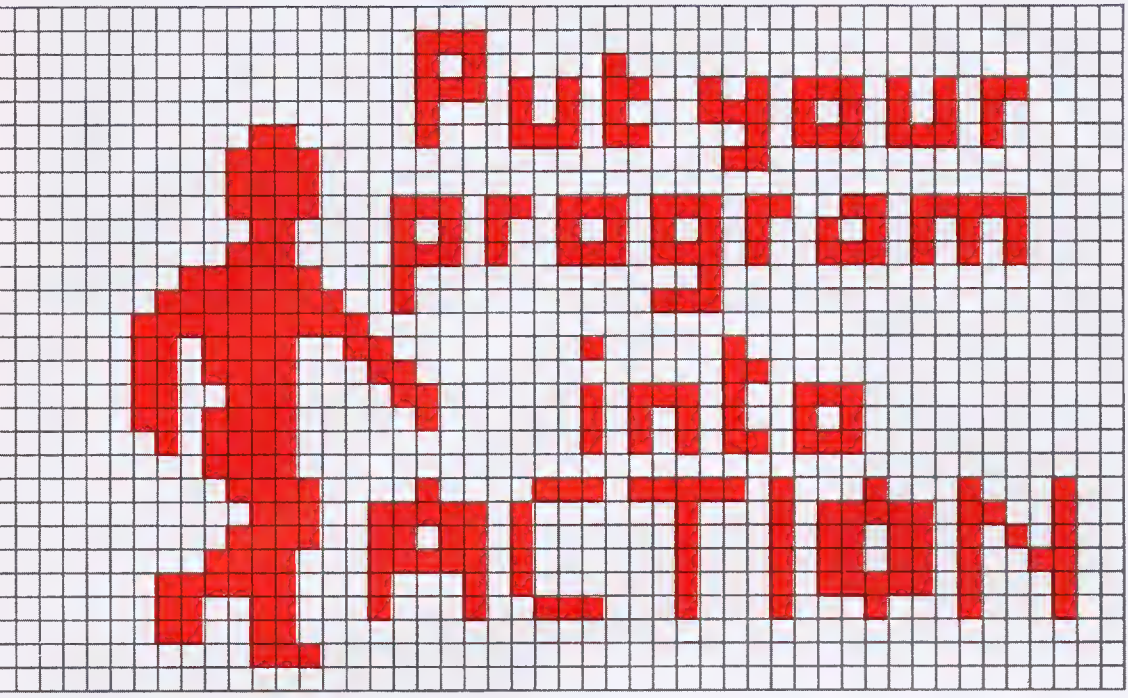
On the left is a Basic program that shows the difference in the methods.

Notice that when using the text method the character to be printed is preceded by a space which is used to overwrite the previous character.

The graphic method is to draw and undraw characters either by using the logical operations available from within GCOL or drawing over the previous picture in the background colour. This method can result in slow jerky animation, but an improved method will be

```
  0 REM Graphic method
  5 MODE4
  8 VDU23;8202;0;0;
 10 GCOL3,3
 15 VDU5
 20 VDU23,224,255,129,129,153,153,12
9,129,255
 25 A$=CHR$224
 30 B$=CHR$32+CHR$224
 35 WX=5
 40 oldX%=0
 45 MOVEoldX%,512:PRINTA$
 50 FOR newX%=32 TO 1024 STEP 32
 55   MOVEoldX%,512:PRINTA$
 60   MOVEnewX%,512:PRINTA$
 65   oldX%=newX%
 70   PROCwait(WX)
 75 NEXT
 80 Q=INKEY(500)
 85 REM Text method
 90 VDU4
 95 newX%=0
100 PRINT TAB(newX%,16)A$
105 FOR newX%=0 TO 31
110   PRINT TAB(newX%,16)B$
115   PROCwait(WX)
120 NEXT
125 END
130 DEFPROCwait(T%)
135 N%=TIME
140 REPEAT UNTIL TIME-N%>T%
145 ENDPROC
```

Program 1



By
ALAN PLUME

discussed later. Both techniques can be used to animate larger objects. However, as the objects get bigger, the text method becomes obviously more efficient.

To aid speed it is useful to define each figure in a sequence as a string made up of the required characters with appropriate backspace (CHR$10), linefeed (CHR$8) and space characters (CHR$32). I shall call this a block graphic. In Mode 7, colour and other control characters may be included.

This method is used in Program II to animate a figure walking across the screen.

Each one of the three figures used to produce the sense of movement is made up of a series of redefined characters held in a string variable containing backspace and cursor down characters. The block shapes are shown in the illustration above.

The dots are positioned in the defining characters so that as subsequent blocks are drawn blank areas of the new block overwrite the dots of the previous block. This positioning is the only real skill involved.

One of the major problems of animation on a small micro is the speed of putting the image on the screen versus the refresh or framing rate of the TV or monitor used. A refresh occurs every 1/50th of a second.

However, if the whole image cannot be displayed in this time, or if the drawing is initiated just before one occurs, a vertical scan line can be seen moving across the image.

This would typically happen when moving a large block of characters vertically.

Acorn have thought of this and (at least in OS 1.0 and above) allowed the user to wait for this event. For most programs this can be achieved with *FX 19, but the vertical field event can also be enabled and acted upon from within machine code programs.

This waiting does, of course, slow things down a bit, but also increases the smoothness. A very useful facility indeed!

If you have OS 1.0 or above then replace line 120 by *FX 19. (See Program II.)

Now suppose we would like to create further sequences of movement for this figure, say walking right to left and waving the arms around.

The three original figures used 17 characters out of the normal 32 redefinable characters. Once again (in OS 1.0 and above) there is a *FX call available to extend this range. It is *FX 20, which is said to "explode" the character sets.

There is an error in the User Guide concerning this and a corrected version of the table on page 427 is shown in Table I on Page 20.

For my full program I'd like to have three figures showing movement either way, and say three figures for the arm movements. This means over 32 characters to redefine.

We will thus need *FX 20,1 plus the appropriate repositioning of PAGE at OSHWM + &100. On a tape system this would mean PAGE=&F00 and on a disc system PAGE=&1A00.

Also notice that the characters stored at &C00 now start with Ascii code 128 (&80). The extra set will be stored at OSHWM + &100 and start from Ascii code 160 (&A0).

The additional DATA statements and formation of all the block graphics is given in Program III. Note that this is not a complete program.

It will be a useful exercise for you to see if you can add the right to left movement plus the arm waving to the original program.

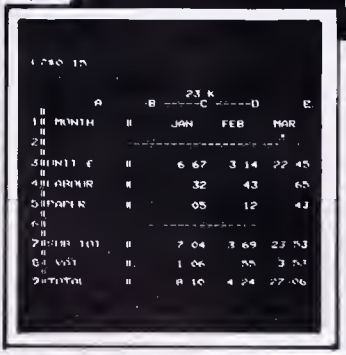
The final example will show that for some more complicated displays

→

..Now available..
for the BBC micro

BeebCalc

The ROM based spreadsheet program



BEEBCALC

Following on from WORDWISE this ROM based spreadsheet program is extremely simple to use though still very powerful. For applications that require a 'spreadsheet' or a table of figures to be manipulated this ROM will be invaluable. It need not be limited to just the obvious business applications of financial planning but is also ideal for home budgeting, etc. Includes many special features such as the ability to transfer 'sheets' to WORDWISE for inclusion into reports. 40 or 80 column screen display. changeable column widths etc.

£34.00+ £1.00 p&p + VAT

WORDWISE

The renouned word processing package. Still clearly the market leader with sales now over 10,000, this has become "the standard" word processor for the BBC Micro — and it's still receiving very favourable reviews. Wordwise will work with tape, disc or Econet and includes automatic word counting and full control over text entered into the system. Supplied with a detailed spiral bound manual and an excellent free typing tutor program.
After 6 months on the market there is still no other product as simple to use and as powerful as Wordwise.

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From Page 17

neither of the above methods is really good enough, and that other techniques are needed.

To illustrate this I'll use the block text method to display a shaded sphere moving across the screen and then discuss the limitations. Program IV should make these apparent.

As you can see, this technique works well enough if the movement is simple and each new position is equivalent to a text position. But what if we wanted the sphere to revolve about the centre of the screen smoothly and at speed?

The first attempt may be to use graphics printing, but the removal of the old object before printing the new one would not give a smooth effect. Try it yourself!

The answer is to move to a four colour mode and use a redefined palette, plus the logical attributes available with GCOL.

All will be explained fully in the my next *Micro User* article.

```
  0 REM WALK1N6 MAN
  5 FOR 1%=224 TO 240
  8 VDU23;8202;0;0;0;
 10   VDU23,1%:READ A$
 15 FOR J%=1 TO 15 STEP 2
 20   VDU EVAL("&"+MID$(A$,J%,2))
 25 NEXT,
 30 DIM M$(3)
 35 MODE4
 40 VDU23;8202;0;0;0;
 45 8S$=CHR$10+CHR$8+CHR$8
 50 8S1$=8S$+CHR$8
 55 M$(1)=CHR$32+CHR$224+CHR$32+8S1$
+CHR$32+CHR$225+CHR$226+8S1$+CHR$32+CH
R$227+CHR$228
 60 M$(2)=CHR$229+CHR$230+8S$+CHR$23
1+CHR$232+BS$+CHR$233+CHR$234
 65 M$(3)=CHR$235+CHR$236+BS$+CHR$23
7+CHR$238+BS$+CHR$239+CHR$240
 70 W%=10
 75 X%=0:Y%=10
 80 REPEAT
 85   I%=1:PROCput
 90   X%=X%+1:I%=2:PROCput
 95   I%=3:PRDCput
100 UNTIL X%=37
105 END
110 DEFPROCput
115   PRINT TA8(X%,Y%)M$(I%)
120   PROCwait(W%)
125 ENDPROC
130 DEFPRDCwait(T%)
135   now=TIME
140   REPEAT UNTIL TIME-now>T%
145 ENDPROC
250 DATA00183C3C3C18387C
260 DATA7C7C7E7F3D3C3C3C
270 DATA0000000080800000
280 DATA3E36373333313139
290 DATA00000000808080C0
300 DATA0003070707030700F
310 DATA0000808080000080
320 DATA1F3F3F1F0F0F0F0F
330 DATA80C0C0E060809888
340 DATA0D0D1D3971E16121
350 DATA8080808080808080
360 DATA0000010101000107
370 DATA00C0E0E0E0C0C0E0
380 DATA0F1F181819180803
390 DATAF0F8CCC6C3C1C0C0
400 DATA010001030F0C0C00
410 DATAE0E0E0C0C0C0C0E0
```

Program II

```
  10 *FX20,1
  20 FOR I%=128 TO 180
  30   VDU23,I%:READ A$
  40 FOR J%=1 TO 15 STEP 2
  50   VDU EVAL("&"+MID$(A$,J%,2))
  60 NEXT,
  70 DIM M$(9)
  80 MODE4
  90 VDU23;8202;0;0;0;
 100 8S$=CHR$10+CHR$8+CHR$8
 110 8S1$=CHR$10+CHR$8+CHR$8+CHR$8
 115 REM Walk lef to right
 120 M$(1)=CHR$32+CHR$&80+CHR$32+8S1$
+CHR$32+CHR$&81+CHR$&82+8S1$+CHR$32+CH
R$&83+CHR$&84
 130M$(2)=CHR$&85+CHR$&86+8S$+CHR$&87
+CHR$&88+8S$+CHR$&89+CHR$&8A
 140M$(3)=CHR$&88+CHR$&8C+8S$+CHR$&8D
+CHR$&8E+8S$+CHR$&8F+CHR$&90
 145REM Walk right to left
 150M$(4)=CHR$32+CHR$&91+CHR$32+BS1$+
CHR$&92+CHR$&93+CHR$32+8S1$+CHR$&94+CH
R$&95+CHR$32
 160M$(5)=CHR$&96+CHR$&97+8S$+CHR$&98
+CHR$&99+8S$+CHR$&9A+CHR$&98
 170M$(6)=CHR$&9C+CHR$&9D+8S$+CHR$&9E
+CHR$&9F+8S$+CHR$&A0+CHR$&A1
 175 REM Wave arms
 180M$(7)=CHR$&A2+CHR$&A3+CHR$32+8S1$
+CHR$&A4+CHR$&A5+CHR$32+8S1$+CHR$&A6+C
HR$&A7+CHR$32
190M$(8)=CHR$&A8+CHR$&A9+CHR$32+8S1$
+CHR$&AA+CHR$&A8+CHR$32+BS1$+CHR$&AC+C
HR$&AD+CHR$32
200M$(9)=CHR$&AE+CHR$&AF+CHR$32+8S1$
+CHR$&80+CHR$&81+CHR$&82+8S1$+CHR$&83+
CHR$&84+CHR$32

480 DATA001B3C3C3C18387C
490 DATA7C7C7E7F3D3C3C3C
500 DATA0000000080800000
510 DATA3E36373333313139
520 DATA00000000808080C0
530 DATA0003070707030700F
540 DATA0000808080000080
550 DATA1F3F3F1F0F0F0F0F
560 DATA80C0C0E060809888
570 DATA0D0D1D3971E16121
580 DATA8080808080808080
590 DATA0000010101000107
600 DATA00C0E0E0E0C0C0E0
610 DATA0F1F181819180803
620 DATAF0F8CCC6C3C1C0C0
630 DATA010001030F0C0C00
640 DATAE0E0E0C0C0C0C0E0
645 REM Walk right to left
650 DATA00183C3C3C181C3E
660 DATA0000000000010000
670 DATA3E3E3E7EFC8C3C3C
680 DATA0000000001010103
690 DATA7C6CECCCCC8C8C9C
700 DATA0000010101000001
710 DATA00C0E0E0E0C0E0F0
720 DATA0103030706OD1911
730 DATAF8FCFCF8F0F0F0F0
740 DATA0101010101010103
750 DATA8080889C8E878684
760 DATA0003070707030307
770 DATA0000808080008OE0
780 DATA0F1F3363C3830303
790 DATAF0F8D8D898D8D0C0
800 DATA0707070303030307
810 DATA800080C0F0303000
815 REM Wave arms
820 DATA0000000000000FF7F
830 DATA0060F0F0F060FCFE
840 DATA0301010100010101
850 DATAFFF8F8F8F3FBF8FA
860 DATA0101010101010103
870 DATA9898989898989898C
880 DATA0000000000000307
890 DATA0060F0F0F060FCFE
900 DATA0F0D0D0D0C0D0D0D
910 DATAFFF8F8F8F3F8F8F8
920 DATA0501010101010103
930 DATA9A9898989898989C
940 DATA000000000000070F
950 DATA0060F0F0F060FEFF
960 DATA1B3161C180010101
970 DATAFDF8F8F8F0F8F8F8
980 DATA80C0603010000000
990 DATA0101010101010103
1000 DATA9898989898989898C
```

Program III

From Page 19

Ascii code	Memory used	X%
&20 to &3F	OSHWM + &300 to OSHWM + &3FF	4
&40 to &5F	OSHWM + &400 to OSHWM + &4FF	5
&60 to &7F	OSHWM + &500 to OSHWM + &5FF	6
&80 to &9F	&COO to &CFF	1
&A0 to &BF	OSHWM to OSHWM + &FF	1
&C0 to &DF	OSHWM + &100 to OSHWM + &1FF	2
&E0 to &FF	OSHWM + &200 to OSHWM + &2FF	3

Table I

```
   5 FOR I%=224 TO 227
  10   VDU23,I%:READA$
  15   FORJ%=1 TO 15 STEP 2
  20   VDU EVAL("&"+MID$(A$,J%,2))
  25 NEXT,
  30 MODE4
  35 VDU23;8202;0;0;0;
  40 BS$=CHR$10+CHR$8+CHR$8+CHR$8
  45 A$=STRING$(3,CHR$32)+BS$+CHR$32+
CHR$224+CHR$225+BS$+CHR$32+CHR$226+CHR
$227
  50 X%=0:Y%=0:W%=10
  55 REPEAT
  60   PRINT TAB(X%,Y%)A$
  65   X%=X%+1:Y%=Y%+1
  70   PROCwait(W%)
  75 UNTIL Y%=30
  80 END
  85 DEFPROCwait(T%)
  90 N%=TIME
  95 REPEAT UNTIL TIME-N%>T%
 100 ENDPROC
 105 DATA00031B0520180708
 110 DATAE0009C4CFC7666FF
 115 DATA010624052A130900
 120 DATAEEFEFC44FCF0E000
```

Program IV

Useful tips

● *It should be remembered that different modes use pixels of different sizes. The height to width ratio is 1:1 in Mode 1 and Mode 4, 1:2 in Mode 2 and Mode 5 and 2:1 in Mode 0. This can give odd effects when using characters in modes other than the one they were designed for. It can, however, also be used to good effect . . .*

● *When using a large number of redefined characters as in program II or its extension, it can be useful to form the character set once and then save it on to tape or disc using:*

```
*SAVE file1 C00 CFF
*SAVE file2 1900 19FF
```

This example would save the two character sets used in the full walking main program onto disc or tape. They could be reloaded into any program that requires them using:

```
*LOAD file1 C00
*LOAD file2 1900
```


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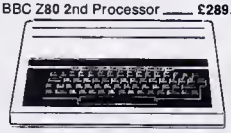

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Where infants pick up a micro instead of a crayon

THE BBC Micro has at last reached the infants' classroom. At Hollingwood Lane First School, Bradford, it has become an integral part of daily life, with children from the youngest child upwards using the micro as naturally as they would a book or crayons.

Headmistress Wyn Moore, the authoress of a highly respected series of mathematics textbooks for infants and juniors, was quick to see the educational potential of the BBC Micro.

When she heard that her local education authority was giving courses on the use of the micro – mainly for teachers of older age groups – she joined one, and then persuaded the authority to lend her a machine.

"Two workmen came in and just left it. That's when the anguish started." Unfortunately they delivered a machine with a disc interface, but no accompanying drive. This, of course, required *TAPE entered before it would work on a cassette system.

However, if you don't know what a DFS is, and have just started Basic, you wouldn't know that, would you?

Fortunately Wyn has two computer-literate sons who helped her over the initial hurdles, though they could not spare her the frustration of trying to find a compatible cassette recorder.

Once she had sorted that out all she had to do was run the software. "But, save for the Welcome tape, there wasn't any," she said.

Bradford LEA, however, had seconded Paul King, an experienced middle school teacher, specifically for the purpose of compiling a bibliography of educational software. He came to her aid with a version of Logo.

Wyn quickly saw the potential: "But it needed putting into an educational context. Children need to learn, for instance, that left and right are relative terms.

"When someone is coming towards you, and you ask them to turn left, they will go to your right. Children need to appreciate this to be able to use LOGO's turtle effectively".

She and her enthusiastic staff set to work to prepare a series of activities geared to teaching children the use of language describing spatial movements. The BBC Micro was just one part in this.

Eventually they developed more than 30 such activities, involving almost every spatial skill imaginable, from simply telling your left hand from your right, to attempting to give your partner verbal instructions on how to cut out a complex shape from graph paper.

There were mazes, closed and open, a lovely animated "snail's journey", left-right patience, homes for Mr Men and lots of others that the children obviously enjoyed.

Much of the equipment was homemade, some games involving ingenious uses of standard school equipment such as attribute blocks.

Wyn and her helpers also devised three or four programs to help with the process. "They're primitive, but we're learning," she said.

The programming techniques might not be the most sophisticated, but their educational validity, unlike so much of educational software, is impeccable.

High point of my day was seeing five-year-old Andrew typing in his answers to the computer, and editing them with the ease of a veteran. He was "hiding" in a house, and the BBC Micro was interrogating him to find out where.

It wasn't having too much success, but just to be on the safe side, Andrew kept the card with the answer on well hidden!

"The trouble is," said Wyn as I left, "there just isn't enough software. One of our colleagues went to an educational exhibition specifically to buy software, and couldn't find a single item."

I know what she means. But with a school like hers working on the problem things are already beginning to look up.

Clive Kelly

DISC USERS

– IF YOU USE DISCS YOU NEED "THE KEY"

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1. FORM 40 – Format 40 track discs.
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4. EDITOR – Allows the user to alter and customise programs, even those which are not listable.
5. RETRIEVE – Enables the user to recover data or programs that have been accidentally erased.

The real workhorse of the package is EDITOR which allows the user to see a sector in HEX and ASCII, and to then alter that sector and write it back to disc. There is provision for automatic and manual searches of the sector and the instructions contain useful tips on what to look for, and where to look for it. The sector can also be dumped to printer for in-depth analysis.
The program is very easy to use and control is mainly through the function and cursor keys, whilst on-screen prompting provides all the necessary information. One recovered program or a back-up copy that is actually needed will pay for this package, and will continue to show its worth time and time again.
This is the sort of utility that should be provided with every disc drive sold as it becomes indispensible once used. At a price of £12.95 "THE KEY" represents very good value when compared with the many formatting programs being sold for around £10.00

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C.A.D. SOFTWARE

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This program must be seen to be appreciated – your imagination is the only factor to limit its individual applications.

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- **FUNCTIONS:** Line, rectangle, triangle, circle, text (upper and lower case) and colour pallet (8 colours and flashing).
- **DRAWING AIDS:** Alignment grid, circle copy, delete, free memory, purge memory, variable cursor speed, clear screen and redraw.
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- SPECIAL FACILITY – Rubber band mode – A very flexible and variable line drawing facility – must be seen.
- Free "redraw" routine to enable the pictures created to be displayed in your own programs.
- The disc version allows screen saves, which take approx. 3 seconds.
- **Recommended by BBC Micro User.**
- GRAFKEY (keyboard and joystick cassette version) **£7.95**
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REPLICA

(Another disc utility program to make your life easier)

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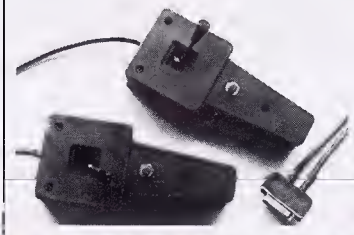

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BATTLE of

THE two buggies in the ring are, in the red corner, from Economatics, weighing in at £160, the BBC Buggy. And in the blue corner, from Jessop Microelectronics, weighing in at £350, the Edinburgh Turtle.

A buggy is a small, wheeled creature that can be controlled by your micro. Its main function in life seems to be driving your dog to distraction.

That aside they can be great fun, and there is educational value in them as well.

The Edinburgh Turtle is constructed inside a hemispherical dome of Perspex and consists of two ironless-rotor motors with optical pulse feedback, a pen lowering mechanism and loudspeaker.

When it is powered up it gives a rendering of Scotland the Brave.

The referee is MIKE COOK

The umbilical is a round section multicore cable which fits into a 15 way D type socket on top of the dome. This plugs into a control box which contains its own power supply along with a controlling microprocessor. The control box then plugs into the RS432 socket in the BBC Micro.

A glance will tell you that it is a precision engineering product and, as it has its own microprocessor, it is not restricted to being used on any one computer. It comes with OK Logo software, a Logo-like language written in Basic.

This allows the Turtle to be used to draw shapes with a pen as it moves around the floor.

Logo is a language that has taken off in schools, especially primary schools, where it is used to teach children about geometry and problem-solving in a stimulating and exciting way.

It basically consists of commands to move the Turtle forward or backward a certain amount or to turn it through a number of degrees.

Using this, the children build up procedures which make the Turtle move and draw what they want. For example, they can be given problems to work out such as trying to get the Turtle to produce a hexagon.

Here accuracy is important, as younger children are not willing to accept a line that does not quite join up.

The rival Buggy has two stepping motors, several sensors and a pen holder attached to a relay. Its umbilical wire is 20 way ribbon cable leading to a small circuit board. This contains a 10 LED bar display and leads going to the user port, the analogue port and the power supply.

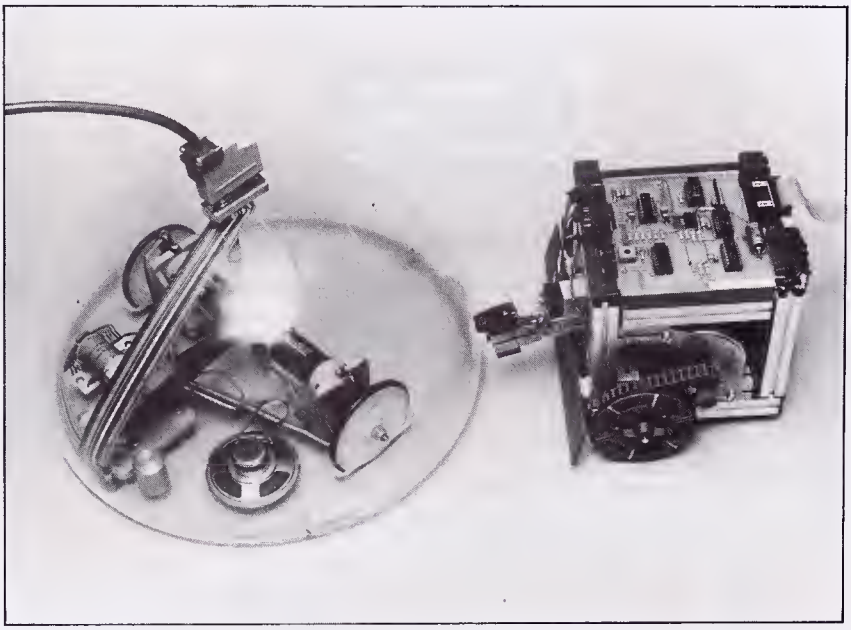
In contrast to the precision engineered Turtle, the Buggy gives the impression of being made from a child's construction set – which it was!

The Buggy is controlled directly from the BBC Micro and comes with 13 programs. They are written in Basic and are listable. However, there is not a great deal of difference between one program and the next, although I think they are designed to show an increasing level of sophistication.

One allows Logo-like commands to be used and, in addition, the Buggy's position is shown graphically on the screen.

Where the Buggy really scores over the Turtle is in its sensors. There is an adjustable probe on the front for placing an infra-red bar code reader and light dependent resistor. In addition, there are two micro switches connected to bumpers on the front.

Using these, the Buggy can sense



Fact to face: On the left, the Edinburgh Turtle. On the right, the BBC Buggy

the BUGGIES

something about its surroundings.

However, in practice I found the bar code reader difficult to adjust for proper operation and it kept getting in the way of the bumpers doing their job.

The stepping motors on the Buggy get very hot after a few hours' operation and you cannot bear to leave your fingers on them. Stepping motors actually get hotter when they are standing still than when they are moving.

I was pleased to see the Turtle is totally enclosed and uses a type of motor which does not get as hot, so the problem will never arise.

The dome of the Turtle allows it to shed its cable easily and prevents it from becoming entangled, whereas the Buggy has a habit of getting tangled up unless you hold the cable clear.

The Buggy's actions are jerky, and backlash in the plastic chain arrangement tends to reduce its accuracy.

By contrast the Turtle moves smoothly, slowing down just before it stops. Both need a fairly smooth surface to trundle over, but the Buggy can cope with slightly rougher terrain than the Turtle.

The Turtle's pen in particular does not like going over overlaps in paper, and so all drawing has to be done on one large sheet. In the Buggy's test program the 360 degree turn is about 15 degrees under, but I suspect this is a software fault.

Both can be used in your own programs, but the Buggy is a little more complicated to drive, because it requires a program which constantly outputs pulses to make it move. This means you have to keep stopping the Buggy so that the program can look at the sensors, or incorporate a sensor scan in the loop outputting the pulses.

The Turtle, instead, is sent a command and the computer is then free to sort out the next one, or whatever, while the controlling microprocessor looks after the movement.

In conclusion, I think the accuracy of the Turtle, along with its tangle resistant shape, will make it more suitable than the Buggy for young children.

On the other hand, the sensors on the Buggy make it suitable for a larger variety of applications more appreciated by older children. Also, the older children will perhaps be more tolerant of the small inaccuracies of movement and more careful to avoid being burnt on the stepping motors.

Both machines show how difficult it is to get a device to move in exactly the way you want and in so doing enhance your sense of spatial geometry and develop problem solving skills.

They are also a lot of fun!

THE manufacturers of the Edinburgh Turtle, Jessop Microelectronics, have announced a new, low cost version. The price during a special summer promotion is £145 – less than half the previous price of £350.

The reduction has been made possible by running the turtle from software in the BBC Micro itself via the user port, which obviates the need for a microprocessor inside the Turtle. The new Turtle also gets its power direct from the BBC Micro.

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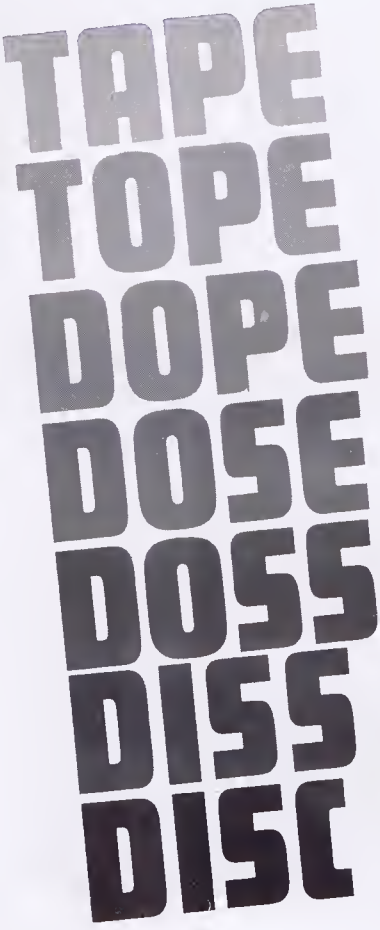

Painless switch from cassette to disc

By PETER WALKER

If you have recently upgraded your BBC Micro to use discs, you may have found that your favourite programs will not now run correctly.

Which may raise doubts in your mind as to why you have paid a small fortune for this new fangled gadget when most programs will not work with it!

Well fear not, because they will.

After getting your computer back from the upgrade, and switching on, then wondering about your new message "Acorn DFS", all seems to be normal.

But all is not. Your machine is now switched into the Disc Filing System. So when you try to load a program from cassette you can't get the tape to go around.

Typing *TAPE, puts you back into the tape system. This is not the only change that has taken place. The disc system grabs some of your precious memory space – it has moved the start of basic memory to &1900.

To get it back type PAGE=&E00. You can now use your machine to load and run cassette programs.

So to run a tape program after switching on, or after pressing BREAK you type:

```
*TAPE
PAGE=&E00
```

Before we find how to run programs from disc, you first must know how to transfer programs from tape to disc correctly.

One command built into the BBC Micro is invaluable for doing this – *OPT1,2. This gives you vital information about the program on tape or disc.

After *OPT1,2 has been set the computer, once it has loaded the program, will display various numbers on the screen, such as:

```
Program_name AA BBBB CCCC  DDDD
```

The letters mean:

AA = Number of blocks on the tape.
BBBB = Length of the program.
CCCC = Start address of the program.
DDDD = Execution address of the program used for *RUN OR CALL &DDDD.

To copy this program type:

```
*TAPE
*OPT1,2
*LOAD"Program_name"1100
*DISC
*SAVE"PROGRAM_NAME"1100+BBBB DDDD
```

If the start address is above &1100 the program should be loaded using:

```
*LOAD"Program_name"CCCC
```

and saved using:

```
*SAVE"Program_name"CCCC+BBBB DDDD
```

But if this is a program which you just use LOAD or CHAIN, then you still must use the first method of copying it, not the second. I must add that it is illegal to make a copy of your

program for any other person than yourself, as this infringes the copyright laws.

So now let's find out how to get your programs to work off disc.

Firstly load it from tape and try to run it. You may be lucky. If it does work just type, *DISC or *D., to put the machine back into disc system and SAVE it as normal.

You should now be able to type CHAIN"program_name" and it should work.

If, when you loaded it from tape, it did not work, there are a number of things you must check before proceeding further.

- *Are there any CALLs to machine code?*

Find out by listing the program if you can, and searching through it. If there are any you must use the second method to get it to work.

- *Is the program run by *RUN?*

Again, this is easily found out. In certain cases one program will load and run another.

This will have CHAIN or CH. if it is in Basic and *RUN if it is machine code. If this is the case you must use my second method to get it to work.

Programs which produce an error message like "Bad Mode" or "No room", may be run by setting the page lower in memory.

When in DFS you lose over 2k of memory, but the disc does not use all of it. For example if you do not use any file handling commands such as OPENIN, BPUT,BGET etc, you can move the Basic memory down to &1300.

But if you don't use the commands *SPOOL or *EXEC, this can be moved down to &1100, so retrieving 2k of memory, leaving the DFS to use 3/4k for its work space.

METHOD I: Move the page down to &1100 by typing PAGE=&1100 and try to run it. (If it still does not work move onto Method II.)

If Method I works you still have to type in the page command, which means that you can't just type CHAIN"program_name", after you switch on.

The easiest way of getting round this is to type in a small program that sets page for you and then loads in the program:

```
10 PAGE=&1100
20 CHAIN"Program_name"
```

When this program is run it will move the page down and run the main program for you automatically.

METHOD II is the more versatile of the two, because it will get almost any program to run from disc. Of course it is also the most complex!

The basic ideas are:

- Load the main program down to &1100.
- Load the machine code move routine.
- Set page to &E00.
- Set tape system.
- Call the move routine.
- Old the program.
- Run it.

The effect of this is to move the program down to &E00 (normal Basic memory) and then to run it.

This is the machine code program:

```
10 REM (c) Peter Walker
20 MF=&1100:MT=&E00:AA=&0901:BB=&0904
30 FOR C=0TO1:P%=&0900
40 [:OPT C
50 .LOOP LDA MF:STA MT:INC BB: BEQ TT
60 .RT INC AA:BEQ FR:BNE LOOP
70 .TT INC BB+1: BNE RT
80 .FR INC AA+1:LDA AA+1:CMP#&7B:BNE
LOOP:RTS
90 ]:NEXT C
100 *DISC
110 *SAVE"MOVE"0900 0923
120 END
```

This routine will deal with all programs which require moving down memory simply by altering a few variables.

MF = Location the program is to be moved from.

MT = Location the program is to be moved to.

P% = Location of the machine code move routine.

You may have to change these program variables for your own use. For example, if when you transfer the program to disc the OPT command tells you that the program starts at a place in memory below &E00, MT will have to be changed to this new address and the program run again.

In the unlikely case that the start of the program address goes below &900, then the value of P% will have to be changed to something above &7B00, MT changed to the new start of program address, and the program run again.

When you have run this program the machine code will be saved onto the disc under the file name "MOVE". It is also advisable to save the original program.

Once this has been done you are ready to use the program as described. You need a short program to load and run the main program:

```
10 *KEY0 *LOAD"Program_name"1100|M
*LOAD"MOVE" |M PAGE=&E00 |M *TAPE |M
CALL&0900 |M OLD |M RUN |M
20 *FX138,0,128
```

If the program uses *RUN replace:

```
OLD|M RUN|M
```

with:

```
CALL &DDDD
```

where DDDD is the execution address as shown earlier.

Line 20 puts the value for function key 0 into the keyboard buffer, so you do not have to press it yourself.

Using the method described above I have been able to get about 95 per cent of all my tape programs to run off disc.

Once you have learned to use the method you should have no difficulty in getting them to work.

If you can buy programs on disc do so, because the nominal charge for the disc which most software houses charge is well worth paying, as you also get all the space left on that disc for your own use. You will be surprised just how quickly you can use up all of your available disc space!

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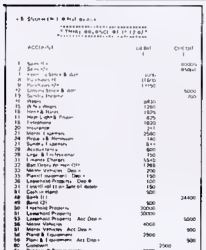

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Requires Cash Book module. This program will take your cash book data to the logical conclusion of balance sheet, trading and profit/loss account and notes to the accounts i.e. fixed assets, land and buildings and capital accounts. Final accounts (BBC version) links to 'Beebplot' for graphic data presentation.

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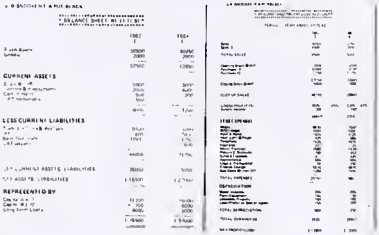

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	POSITION A1 RC SPACE 5185 T		
	II A II B II C II		
1	–J.B. SNOOKER T/A POT–BLACK		
2	PROJECTED CASH FLOW	YEAR	ENDED
3			
4		Oct.	Nov.
5		£	£
6	INCOME		
7	Sales	11786	10944
8			
9			
10	REVENUE EXPENDITURE		
11	Purchases	500	500
12	Advertising	500	1000
13	Director's salary	1596	1596
14	Salaries	2216	2216
15	Rent		
16	Telephone		300
17	Insurance		200
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19	Repairs & renewals		
20	Hire of equipment	60	60

COMMAND BCDEFGPRSTW*?

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- Comparing rent/lease/buy options.
- Processing the results of scientific experiments or field studies.
- Engineering calculation models.
- In fact, anything that involves repeated re-calculation of results presented in tabular or spreadsheet format.

Program Availability Chart:–

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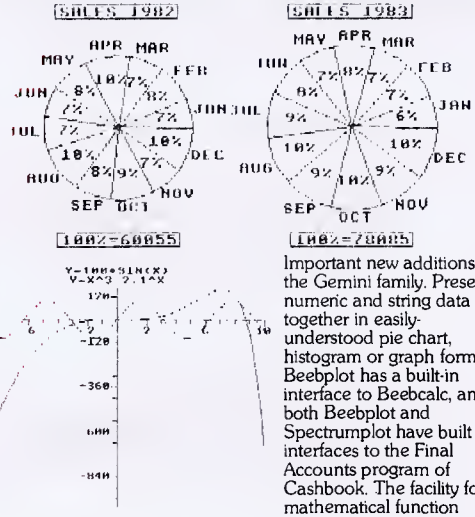
Sinclair Spectrum 16k or 48k	●	●	●			●		●	●	●	●
Dragon 32k or 64k	●	●	●	●	●			●	●	●	
VIC 20 (16k +)	●	●	●	●				●	●		
Sinclair ZX81 (16k +)	●										
Grundy Newbrain	●		●								
Sharp MZ80A	●	●	●	●				●	●		
Sharp MZ80K	●	●	●	●				●	●		
Sharp MZ80B	●	●	●	●				●	●		
BBC Micro model A or B 32k	●	●	●	●	●	●	●	●	●	●	●
Atari 400/800	●										
Torch	●	●	●	●	●	●	●	●	●	●	●
Epson HX-20	●	●	●								
Commodore 64	●		●					●			

BEEBPLOT & SPECTRUMPLOT £19.95

NEW



Important new additions to the Gemini family. Present numeric and string data together in easily-understood pie chart, histogram or graph format. Beebplot has a built-in interface to Beebcalc, and both Beebplot and Spectrumplot have built in interfaces to the Final Accounts program of Cashbook. The facility for mathematical function plotting is also provided. The BBC version has a high resolution screen dump for the Epson or CP-80 printers, and the Spectrum version dumps to the Sinclair printer via the 'copy' key. A very useful program that will give superb results either from direct input of data from the keyboard or via simple access to other software data files. A must for business and education.

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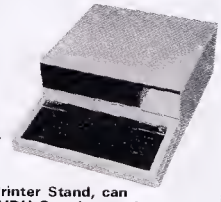

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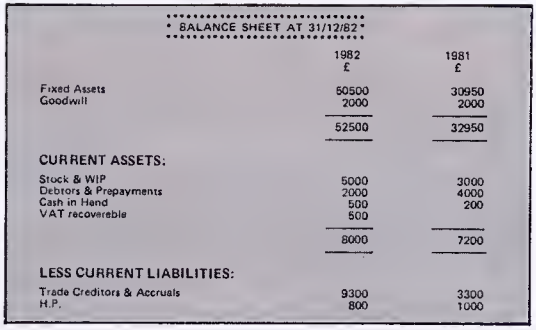

BALANCE SHEET AT 31/12/82

	1982 £	1981 £
Fixed Assets	50500	30950
Goodwill	2000	2000
	52500	32950
CURRENT ASSETS:		
Stock & WIP	5000	3000
Debtors & Prepayments	2000	4000
Cash in Hand	500	200
VAT recoverable	500	
	8000	7200
LESS CURRENT LIABILITIES:		
Trade Creditors & Accruals	9300	3300
H.P.	800	1000

Cashbook (Gemini)

CASHBOOK from Gemini is a comprehensive and adequate accounting system. It will enable business people with a moderate grasp of accounting principles to produce a set of figures that will satisfy both the bank manager and the tax man.

More important, it will give a confident grasp of the business's finances and profitability.

Cashbook offers no fewer than 80 predefined accounting codes covering all matters a conventional business is likely to encounter. Receipts can be analysed into 12 classifications and any single payment can be split into five. This means that the micro bookkeeping activity becomes an integral part of the "cash-up and bank" routine at the end of each commercial working day.

Just as transactions are batched together and a batch record printed (to match the paying-in or cheque counterfoil if desired), so there is no need for separate pen and paper records.

The journal (of cumulative transactions under any account code) can be inspected on demand, and the system contains an impressive array of checking routines. Cash and bank balance checks are available as required.

The system proceeds to trial balance (making sure all the figures add up before worrying about how to present them) and, after final adjustment, a separate program is used to produce a balance sheet and a profit and loss account. There is the customary provision for printing the results of a previous year alongside for comparison.

It must be stressed that this program is designed for an average, conventional business. Anyone running a nudist colony or a crocodile farm might find that although everything needed is provided (at least so far as accounts are concerned!), so are many redundant codes that take an irritating time to skip over.

For example, young mothers running a nursery school would legitimately jib at "wife's wages" as well as the countless codes for motor vehicles and "plant". It might have been better to set the major categories of codes (income, running costs, depreciation, etc) and left the detailed codes for the user to define.

This would have avoided incongruities such as allocating only four analysis codes to sales while allocating an equal number for invested capital. A dozen user-definable codes at the end would have provided for the quirks of individual businesses.

I also feel that too little help is given to the user who has no accounting

→

Arcadians (Acornsoft)

Action in Arcadia

THIS colourful shoot-them-out-of-the-skies game, can be played with either keyboard or joysticks.

There aren't any bases for you to hide behind, so your only hope of survival is to get out there and attack.

There are four different kinds of Arcadians and none of them want to make friends. If you can hit them when they're flying down you get bonus points, and once you've cleared the first screenful they all come back again.

The speed of attack and the number of Arcadians in flight at any time increases as you get further into the game.

The keyboard controls actually seem better than the joystick, and with just a little practice you should easily be able to murder several screenfuls of Arcadians before your three chances are up. A nice feature is the one or two player option, and the sound effects are also good.

If you get to 7,000 points you are awarded an extra laser base, and no doubt addicted Invaders addicts will be up until the early hours with this game, reaching high levels of skill and ingenuity.

Perhaps for the rest of us though, it lacks the sophistication which the BBC Micro really deserves – not through any fault of design, just because it's all been done before, and probably better.

Jane Jackson

From Page 35

background. The guide tries to help but it takes many months to digest such accounting jargon as "accruals", "assets" or "WIP".

The program, too, is a little curt, and could do more to comfort the novice. When you want to know where to enter the £500 loaned you by Auntie Maud, to be confronted with "Capital Intro (1)" is a little frightening.

It would also be useful if the program gave a friendly nudge each time the user is confronted with "Debit (D) or Credit (C)". That may be adequate for payments into a bank account but how about offsetting the depreciation on a crashed, middle-aged Cortina with a payment for half a new one from an insurance settlement?

Many small business advisers encourage clients to abandon double entry bookkeeping altogether, but Gemini have probably been wise to stick to conventions at this early stage in the development of Micro usage.

It would be unfair to expect one floppy disc-full of program to provide a full training in accountancy, and these comments must not obscure the fundamental value of the package.

The average small entrepreneur with no more than a couple of employees (or wives!) expects to pay between £200 and £500 in accountant's fees each year as well as doing the bookkeeping.

At £95 all in, this program will help save time and errors in the bookkeeping and then avert the final accountant's costs, provided that the user masters it thoroughly. However, let no one overlook the valuable guidance in tax matters that may be lost if the accountant is paid off.

Those with no business accounting or bookkeeping experience should acquire some before buying this program.

All potential users, especially busy ones, should allow a couple of months tryout time before starting serious use, and should run their accounts manually in parallel for a full financial year before trusting the Cashbook system on its own.

Gemini's program will work fine but don't forget the gremlin called "human error".

John Vogler

Bakery bun fight

Bun Fun (Squirrel)

ONCE upon a time, in the long ago days when I was a student, I used to work in a bakery as a summer job. I found it was both great fun and hard work. The same goes for Squirrel Software's Bun Fun.

The idea is that you are a worker in a bun factory. Cakes pass in front of you on a conveyor belt and it's your job to put on the icing.

Your mate further along the belt puts on the walnuts and you get paid piecework.

The more perfect cakes you make the more you earn. The more you waste the less you take home.

Sadly, your mate has just cleared off to do some fishing and you're left to do both the icing and the walnuts. Oh yes, and you mustn't make too much mess or the machine will jam!

With five levels of difficulty and five choices of how long you want to play, Bun Fun is fast and furious.

Strictly for those not of a nervous disposition, it's a game calling for fast reactions – the kind of game where an 11-year-old will beat his or her parents every time.

Easy to learn, well explained and fun to play, it's a game that will drive you mad ... but you won't mind.

However there is one drawback – unlike my time at the bakery, you can't eat the end products.

Nigel Peters

Space Invaders...plus

Alien Destroyers (Program Power)

ALIEN Destroyers is a Space Invaders type game with novel additional features.

It is for keyboard play only, but you can choose which keys you use to move left, right and fire, making it easier for you to settle into a championship position and reach high scores.

You have three bases, and more can be earned as you reach higher scores. The first screen of invaders appears against a vivid blue background and this alternates with a more restful black sky, but there is no escape from the menacing bombs in either game.

You can hide behind the defences while they last, but your only real hope lies in attack.

One of the nice things about this version is the amount of choice there is in choosing a level of skill at which to play.

You can set the alien speed at any of six levels, the bomb speed at three, (fast, very fast and very, very fast), choose whether to have the aliens advancing or not, (why be foolhardy!), whether to have vertical bombs only or risk the multidirectional shrapnel, and whether to have a fast base or not.

All this makes it a much more versatile game than a Space Invaders version might have been.

Also, after each game you get a full battle report – which tells you how many of each alien you destroyed, how many screenfuls you eliminated, how many torpedoes were fired and the percentage of these which hit one of the aliens, how many of your bases were hit, what your final score was and at what level you were playing.

The game also has an invaluable pause button, useful when things just get too much!

Altogether this is a fun, colourful game which, despite only having keyboard controls, has a lot of good points to recommend it.

Linda Case

Midwich
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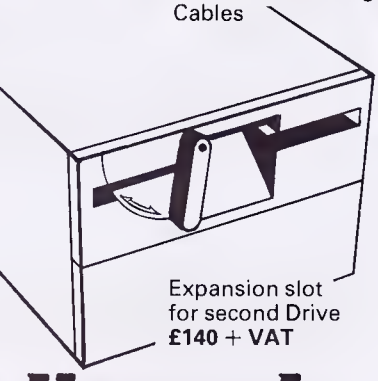

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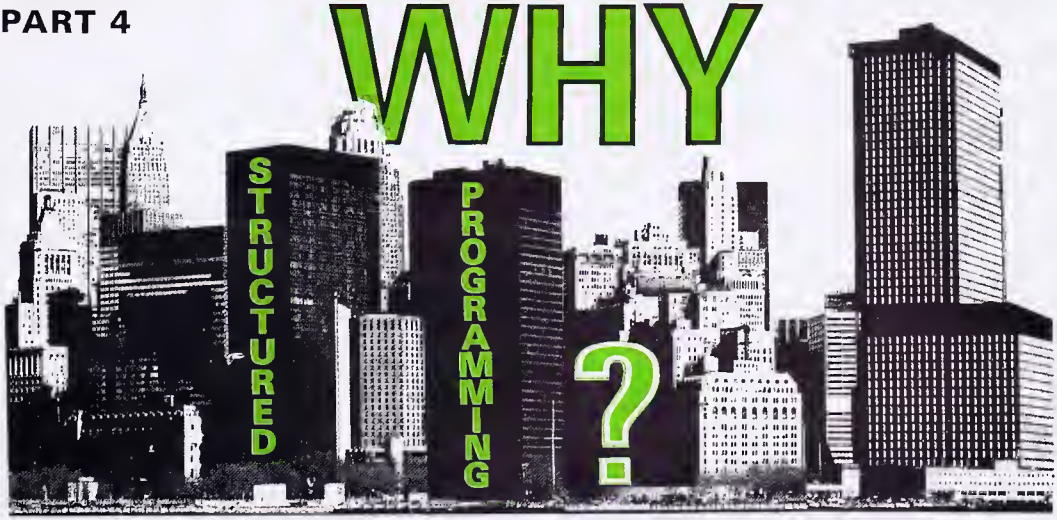
PART 4

WHY STRUCTURED PROGRAMMING?



Take the right line to keep things moving

By ROY ATHERTON

"And always moving as the restless spheres." Tamburlaine the Great – Christopher Marlowe, 1587.

ONE of the first electronic calculators to appear on the UK market was called Anita. It cost about £900 at 1965 prices and it was very heavy, though described as portable.

In those days the difference between a calculator and a computer was simple. Anita could do computations but it could not store a sequence of instructions. It was definitely a calculator. A computer, on the other hand, could store a set of instructions and whizz through them without human interference.

Sometimes the intermediate results in a computing process determine which of two or more courses of action should be taken. Decisions like this are the third major task in program control, the other two being repetition and the organisation of procedures.

A decision, or selection, between two or more processes in a program implies that the programmer has extra work to do so that all possible courses of action are defined along with the criteria for choosing them.

The justification for this extra work is that it keeps things moving.

Without it a task would require several or many programs instead of one and would take very much longer to complete.

Just as the right loop structures enable a programmer to magnify his effort in a controlled way and procedures help him or her to deal with complexity, so the right structures help to keep clear the different possible paths through a program.

CONCEPT: Simple binary decision

Simulate the deputy sheriff's decision to reload when his gun is empty.

We have already seen the programming of this example which was slipped into an earlier program without much discussion. Discussion is necessary however and we should start with an appropriate design.

```
DESIGN
IF shots = 6 THEN
reload
ENDIF
```

This design follows the usual pattern of having opening and closing keywords and content lying between them. If we weaken this concept by allowing exceptions then we should be aware of what we are doing, and in particular we should keep the full structure as our starting point, soon to be expanded into essential generalisations.

Unfortunately the word ENDIF is not available in BBC Basic so the program code is different in detail and layout.

```
SYNTAX
IF shots = 6 THEN PROCre_load
```

It is worth noting that the use of a procedure could be avoided here because the content of the structure can be several statements separated by colons.

```
SYNTAX
IF shots = 6 THEN PRINT "Eject used cartridges": PRINT "Load new bullets"
```

Such extensions should be used with discretion because the layout is unhelpful. Imagine, for example, the effect of putting a loop within the content of such an extension.

Comal, in common with many other languages, allows some "short structures" but limits their use to those whose content is a single statement. In Comal one would have to write:

```
IF shots = 6 THEN
PRINT "Eject new cartridges"
PRINT "Load new bullets"
ENDIF
```

This should be regarded as the correct, full or global concept in which there are no artificial constraints on what can lie between IF and ENDIF. When working on the program design this should be used. The translation into BBC Basic may be best done with a procedure as already suggested.

CONCEPT: General binary decision

There is a more general type of binary decision than just action or no action – the one which Hamlet found so difficult. There is the choice between two different positive alternatives.

Simulate a saloon bar customer tossing a coin to decide whether he should

→

From Page 39

drink whisky or beer.

DESIGN
coin = RND(2)
IF coin = 1 THEN
drink whisky
ELSE
drink beer
ENDIF

Again, regrettably, although ELSE is a keyword of BBC Basic it cannot be used on a separate line to close one global structure and open another.

SYNTAX
coin = RND(2)
IF coin = 1 THEN PRINT "Drink whisky" ELSE PRINT "Drink beer"

If the content of each part of this structure is anything more than one or two statements, clarity and control is best preserved by embodying each segment in a procedure.

IF coin = 1 THEN PROCwhisky ELSE PROCbeer
–
–
–
–
–
DEF PROCwhisky
–
–
–
ENDPROC
DEF PROCbeer
–
–
ENDPROC

We need to be careful not to misuse decisions. The combination of binary decisions and GOTO statements could replace all the structures except procedures, but that does not mean that they should.

Let us return to a simple solution to the problem of the deputy sheriff and the bandit, with the added complication that if the deputy runs out of ammunition he must retreat.

We might be tempted to use a GOTO statement. Suppose he starts with ammo of 30 bullets.

```
 10 shots=0:ammo=30
 20 REPEAT
 30  gunout=RND(20)
 40  PRINT "Fire a shot"
 50  shots=shots+1:ammo=ammo-1
 60  IF ammo=0 THEN GOTO 100
 70  IF shots=6 THEN PROCre_load
 80 UNTIL gunout=20
 90 PRINT"Bandit throws out gun"
100 REM Out of ammo
110 PRINT "Retreat quickly"
120 END
```

We assume a sensible reload procedure, and the program seems, at first sight, to take proper action if the deputy runs out of bullets. Unfortunately if the bandit throws away his gun the effect is:

Bandit throws out gun
Retreat quickly

Of course, the deputy should arrest the bandit so we "patch" the program.

```
 60  IF ammo=0 THEN GOTO 120
 70  IF shots=6 THEN PROCre_load
 80 UNTIL gunout=20
 90 PRINT "Bandit throws out gun"
100 PRINT "Arrest bandit"
110 GOTO 140
120 REM Out of ammo
130 PRINT "Retreat quickly"
140 END
```

This is a familiar situation – one GOTO has led to another. It looks innocent enough but the fundamental rules about structure are broken, and some of the worst programs written started in seemingly innocent ways.

Instead we can remember that, with the exception of a few tricky situations discussed in learned journals, the vast majority of problems can be solved with the standard structures.

The questions to ask are: "Which concept applies?" and, knowing that we have a case of repetition, "What are the conditions for ending the loop?"

The answer is that the loop may end either because the bandit surrenders or because the deputy runs out of ammunition. Let the program design reflect that fact.

DESIGN
REPEAT
Fire a shot
IF gun is empty THEN reload
UNTIL bandit surrenders OR deputy out of ammo

This terminates the loop properly, but we do not know which of the two possibilities is the cause. So we decide using a standard structure.

IF out of ammo THEN
Retreat quickly
ELSE
Arrest bandit
ENDIF

Thus we keep proper control, and we know that however complex our problem may be it is unlikely that such methods will fail.

More important, the ideas and techniques merge into the powerful blend of problem solving and program design skills.

It is known that beginners (not whizz-kids) can acquire the essentials of good program control in a few months or in a formal course of 40 or 50 hours.

In such a time scale, given reasonable ability and interest, most people can easily write good programs of over fifty lines and some will write quite impressive ones of several hundred. At that stage a programmer is ready to reconsider the approach to larger tasks and to polish his techniques using structured design.

The final version of the program is given below. It illustrates a powerful range of concepts: repetition, decisions, procedures, parameters.

```
shots=6:ammo=30
REPEAT
 gunout=RND(20)
 PRINT"Fire a shot"
 shots=shots-1:ammo=ammo-1
 IF shots=0 THEN
number=RND(6):PROCre_load(number)
UNTIL gunout=20 OR ammo=0
IF ammo=0 THEN PRINT "Retreat
quickly"ELSE PRINT "Arrest Bandit"
END
DEFPROCre_load(number)
 FOR shell=1 TO number
  PRINT "Eject used cartridge"
  PRINT "Insert shell"
 NEXT shell
```

There are just four main structures used in this program: REPEAT / UNTIL, FOR / NEXT, IF / THEN / ELSE and DEFPROC / ENDPROC.

Other vital concepts are also present – meaningful names of variables and procedures, and the use of parameters.

There are also the writer's own self-imposed rules about indentation and the use of lower case. The use of a compound condition using OR should be noted.

The use of lower case for variable names, etc. helps readability by contrasting with the upper case keywords. The latter then stand out and help in finding the way around a program, like pubs at street corners help navigation around a city.

This rule also sidesteps some awkward errors which may arise if upper case variable names incorporate, or are the same as, keywords.

These are the essential concepts of program control in BBC Basic and also of sensible problem analysis and program design.

By modern standards they are slightly defective, but, as demonstrated in "Structured Programming with BBC Basic" (Heinemann Education, 1982), with a little care they can support structured programming.

● *To be continued*

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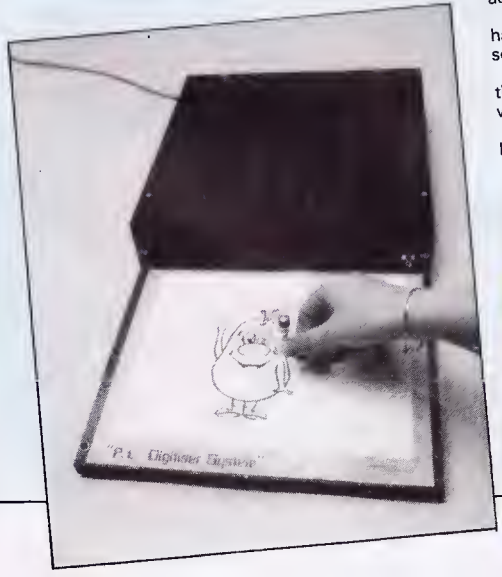

THE prize in this month's *Micro User* competition is a complete graphics system, consisting of a PL Digitiser – as reviewed in last month's issue – together with its powerful new graphics software.

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INSIDE KING KONG

I DON'T often copy programs from magazines, but the game of King Kong, which was featured in *The Micro User* in April, looked so appealing that I decided to devote a few hours to it. I wasn't disappointed – it's quite an enjoyable game – but I found myself becoming increasingly frustrated at some of the features of the programming style.

I admit to being a purist, and to liking good programming for its own sake, but that doesn't mean that good programming is solely for the purists. It can help us all to write more easily, more confidently, and with better use of available memory.

I should point out that King Kong is, in fact, well on the way to being well structured. If it weren't, I wouldn't even have considered trying to copy it.

I know that I can't copy a program without making mistakes (can anyone?). I know that it will be much easier for me to find and correct the mistakes if I understand the program, and a well-structured program is just so much easier to understand than one which is (or appears to be) cobbled together.

This critique of the program is thus along the lines of "Here's how a fairly well structured program might have been improved", rather than "What an atrocious program".

First, of course, there were the actual listing errors: lines 180 and 450 were somehow corrupted before the listing was made. Line 450 wasn't too hard to reconstruct, but a lot of thought had to go into line 180. *(See corrections in May issue – Editor.)*

I know how painful it is to read one's own programs looking for such errors, but it really should be done with programs intended for publication.

And now for the general critique,

Simon says style is all

A case study in structured programming

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From Page 42

split into sections for the sake of clarity.

The program fits into Mode 1, but there isn't a lot to spare. A slightly more ambitious game, or the same game with a few more frills, would have to make do with the two colours offered by Mode 4.

Yet a startling amount of space is wasted by the duplication of significant chunks of code. PROChitcheck repeats the same sequence of statements for four different conditions. A dozen or so variables are initialised identically in lines 240, 850, and 940, and with slight variations in lines 580 and 670; the sequence TIME=0: REPEAT UNTIL TIME>*something* crops up all over the place: and so on.

Let's take the initialisations in line 240 and make a procedure of them – PROCrestart, perhaps.

The procedure can then be called from lines 240, 850, and 940. Add a parameter or two to the procedure, and it would also be able to deal with lines 580 and 670.

Let's write a procedure PROCwait(n): TIME=0: REPEAT UNTIL TIME>100*n: ENDPROC Now every delay loop can be replaced with PROCwait(number), where number is the number of seconds in the delay. We can even replace the for-loop delay in line 550 (which must have come from an older form of Basic!) with PROCwait(2). *(Incidentally, I'm inclined to wonder why PROCthrow has a different delay for each side, in lines 610 and 620.)*

The pattern soon becomes obvious. If you find yourself writing a piece of program for the second time, consider whether it could be a procedure. If you write it a third time, make it a procedure. Not only will you save space, but you'll also reduce your effort, both in the writing of the program and in the making of any alterations later required to that piece of code.

Taking code outside loops

Why ask the computer to do more than it needs to? If you really want to slow it down, you can always use PROCwait. The command GCOL4,0 occurs at the start of line 410, and again further on in the same line (or in line 420, if the other path was taken).

Why the second GCOL4,0? Nothing has happened in the meantime to undo the effect of the first one.

A more extreme case is found in line 570. GCOL0,2 is performed 50 times, inside a FOR loop. One call before entering the loop would give exactly the same picture, but with a lot less work on the computer's part – that is, a lot faster.

All right, the picture isn't drawn particularly slowly, but the same principle applies in cases where speed is more critical. A programmer who learns good habits from the start isn't likely to forget them when it matters.

The principle also applies to IFs. Line 600 says effectively "IF this THEN a: b ELSE a: c". The IF must certainly encompass b and c, but why

repeat a? A better statement would be W%= 680: V%=(Y%-680)/20*DIF%: IF X%>604 THEN Q%=710: H%=(X%-710)/20*DIF%: ENDPROC ELSE Q%=540: H%=(X%-520)/20*DIF%: ENDPROC.

Giving procedures parameters

When King Kong is to be drawn, the program first sets ARM% to the height at which the arms are to be drawn, then MOVEs to the place where it wants to start drawing Kong, then calls PROCkong.

The procedure then draws the body, MOVEs to a fixed x-position and the ARM% y-position and draws the left arm, MOVEs to another fixed x-position and the ARM% y-position and draws the right arm.

There are two problems with this. First, the program takes on a lot of the effort in setting ARM% and MOVEing to the right place. Second, although it doesn't arise in this program, any attempt to draw Kong at an x-position other than 600 will detach his arms, which are drawn at a fixed x-position regardless of where the body is.

Both of these problems can be overcome with amazing ease by passing the starting position to the procedure as a pair of parameters. Look at this version of the procedure:

```
DEF PROCkong(A%,B%)
GCOL0,2: MoveA%,B%:
  VDU224,229,. . . 233,238
MOVEA%-60,B%-20: VDU
  241,239: MOVEA+90, B%
  -20: VDU239,240
ENDPROC
```

Kong can now be drawn at, say, (600,700) simply by calling PROCkong(600,700). No MOVEing first, no messing about with ARM%, no worries about detached arms. Surely it's worth it.

We can do a similar thing with the girls:

```
DEF PROCgirl(A%,B%)
MOVEA%,B%: VDU242,10,8,
243: ENDPROC
```

This is such a small procedure that you must wonder whether it's worth it. But look at the MOVEs and VDUs it saves (in PROCsetup, PROCpick and PROCheli), and notice how much more readable

```
PROCgirl(X%+30,Y%-30)
```

is than

```
MOVE%+30,Y%-30: VDU242,10,8,
243
```

You can actually see the program's intention in the former!

Just to emphasise the difference a little more, look at PROCsetup (line 590). The old version can now be replaced by

```
DEF PROCsetup: PROCskysc:
PROCkong(600,700): GCOL(0,3):
PROCgirl(460,360): PROCgirl
(790,360): ENDPROC
```

Even allowing for the multiple-statement line, this is surely a lot easier to understand than the old version.

Testing conditions

Two points struck me in this area. First, many of the conditions tested in the program can be simplified quite significantly. And second, there are a couple of rather odd conditions being tested, which fall into two categories – the unnecessary and the impossible.

As an example of the former, think about IF PICK%=0 OR Y%>120 OR PICK%=0 AND Y%>120, found in line 660. As an example of the latter, try IF Y%<300 AND Y%>390, in line 630. Neither of these actually affects the program's outcome, but they really shouldn't be there.

And the simplifications? It's really

→

From Page 45

the same old principle. If you find yourself repeating the same code over and over, can it be turned into a procedure? I should have added "or a function?".

Look at the number of times the program tests whether something lowval and something highval. I've found 13, and I don't guarantee to have noticed them all. So let's write a function DEF FNin(X%,low%,high%) = X%>=low% AND X%<=high%.

Every one of those awkward conditions can now be replaced with something like IF FNin(X%,720,900). Space is saved, the program becomes a little easier to read, and there is the added bonus of discouraging such conditions as IF X%+90<590 AND X%+270>=590.

At the end of all this, we can usefully rewrite POChitcheck as follows:

```
450 DEF PROChitcheck: IF
  FNin(Y%,600,650) THEN GOTO
  460 ELSE IF FNin (Y%,651,694)
  THEN GOTO 480 ELSE END
  PROC
460 IF FR%=16 AND FNin
  (X%,320,499) OR FR%=-16
  AND FNin(X%,721,900) THEN
  PROChit
470 ENDPROC
480 IF FR%=16 AND FNin
  (X%,290,469) OR FR%=-16
  AND FNin(X%,751,930) THEN
  PROChit
490 ENDPROC
495 DEF PROChit: HITKONG%
  =HITKONG%+1: SCORE%=
  SCORE%+20: PROCupdatescore:
  PROCchnextsheet: ENDPROC
```

The procedure still has a little scope for improvement, but it's a lot better than the original.

Character sizes and positions

When printing characters at graphics cursor positions, the programmer should always be aware of character size.

For the sake of brevity I shall use the word "pixel" to represent a unique screen address – it is, in a sense, a notional pixel. In Mode 1, a character is then 32x32 pixels in size. But the program doesn't seem to accept this.

Consider Kong's arms. Each consists of two consecutive characters, and so is 64 pixels wide – but the left arm is drawn 60 pixels back from the body, leaving an overlap of 4 pixels.

Perhaps this was intended – but if so, why does the right arm overlap by 6 pixels? It is drawn 90 pixels on from the start of the body, rather than the 96 one might expect in order to move past three characters.

Consider the helicopter. It consists of three consecutive characters, yet there seems to be a consistent assumption that it is 90 pixels wide – look at PROCpick and PROChitcheck for the most obvious evidence.

And last, look at the way PROChitcheck decides whether Kong has been hit. The vertical check is fairly straightforward. Anything at the same level as the arms or upper torso will be considered. Nothing outside that region has a chance (although a missing Y% in line 420 will give a rather odd appearance to all leftward shots!).

But the horizontal checking really seems a matter of guesswork (I almost avoided saying "Hit-and-miss"!). Each shot is drawn over 180 pixels and is valid over a range of 179 pixels, which seems fair enough. There is thus a maximum distance beyond which no shot is effective, which also seems fair enough.

The odd things are, first, that there is also a minimum distance – get too close and you'll miss – and, second, that the minimum and maximum vary almost randomly for the different types of shot.

Shooting left at the torso, you'll miss if you're closer than 25 pixels; shooting right at the torso, you'll miss if you're closer than 4 pixels; shooting left at the arms you can actually overlap the arm by 3 pixels and still score (you can overlap either arm quite significantly without crashing); and shooting right at the arms you can overlap by 26 pixels!

Such inconsistency is easily avoided with a little thought, and is well worth it in the finished product.

INSIDE KING KONG

Boolean variables

The program makes much use of most of the special features of BBC Basic, but seems to ignore the very useful concept of Boolean variables – values which can be either TRUE or FALSE.

PICK%, FLAG, LGIRL%, and RGIRL% are all begging to be used in this way. Their values are only ever 0 or 1, and they are used throughout to indicate whether certain conditions are true or false.

Look at PICK% – set to 0 to start with, to 1 when a girl has been picked up, and back to 0 when she is put down.

In other words, PICK%=FALSE to start with, TRUE on pickup, FALSE again on drop.

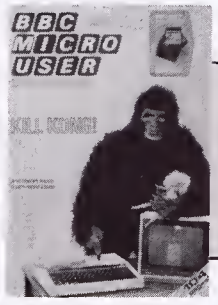
It is not only the assignments which make more sense to the reader this way. Look what happens to the tests: IF PICK% THEN . . .: IF NOT RGIRL% THEN . . .

And the bonus that goes with the improved readability? The programmer doesn't have to remember little details like "If it's 1, it is, and if it's 0, it's not" – the computer now takes care of that.

Natural looping

Generally speaking, the program

→



New readers might like to know that the original listing for the King Kong game appeared in the April issue of The Micro User. The game was also the main program on that month's cassette tape.

Both the magazine and the tape can be obtained by using the order form on Page 73.

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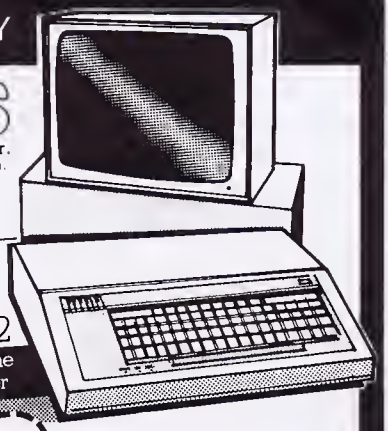

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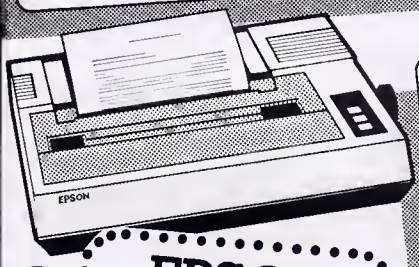

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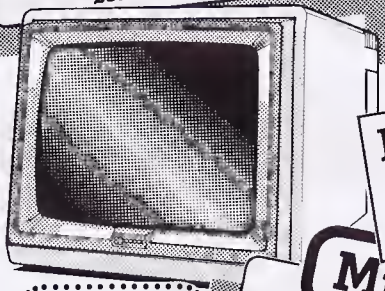

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From Page 47

makes very good use of BBC Basic to loop in the way the game seems designed. In the one place where this principle is deserted (that is, in the program's main loop), it is suddenly harder to see exactly what is going on.

All it takes is three GOTOs, and the whole thing becomes quite obscure. Let's try a more natural way of expressing the same thing *(see panel below)*.

To me, at least, this expresses the whole loop a lot more clearly than the original version. Notice, too, how it delegates its authority.

Printing the scoreboard and the helicopter and sounding the fanfare are all part of the setting-up routine – so have them called by PROCsetup. The rock and its loop counter can all be dealt with in one go, so get a PROCrock to do it.

The explosion and gameover procedures can set "exploded" to true, rather than setting FLAG to 1. And PROCgameover can also ask the player whether another game is required, setting "finished" accordingly.

Another case for natural looping is in PROCskysc, which builds the skyscraper.

A for-loop is used to plot each level of windows, but within a level four separate calls to PROCwin are made to plot the four windows.

Why not another for-loop? FOR L%=20 TO 250 STEP 40: FOR M%=550 TO 710 STEP 40: . . .

Variable names

When speed is required, it does make sense to use the resident integer variables A% to Z%, but because this practice reduces readability care should still be taken in selecting them.

Again, this program has generally

INSIDE KING KONG

done well – X% and Y% for the helicopter position, H% and V% for the rock's horizontal and vertical speeds – but Q% and W% for the rock's position?

Most of the other variables are very well named. But why FLAG? We all know it's a flag. What we'd like to know is what it's flagging – in this case, "exploded".

Apart from readability, a great advantage of meaningful names is that it helps us to keep track of just what variables there are.

Two of the variables in King Kong, FLAG1 and R%, are never used – something which the programmer would have noticed far more readily if they'd had useful names.

Copying with afterthoughts

One often wants to modify a program after writing it. This is quite natural, and nothing to be ashamed of. But modifications should be thought out as if they were new programs, not as if they were additions.

Notice how PROCskysc builds the skyscraper – two MOVEs and two PLOTs to draw the lower rectangle, two MOVEs and two PLOTs to draw the upper rectangle, and then two more PLOTs to tack a bit more onto the top! Those two extra PLOTs could simply have replaced the previous two.

Keeping track of what's been done

When writing a program, don't assume what state the computer is in – think about it. What has happened at the keyboard when we get to line 30? Somebody has just typed RUN and pressed RETURN. So why clear the keyboard buffer?

Where is the DATA pointer when we get to line 730? We've just done a RESTORE 750, and read all the data there, so it must now be on line 760. Which makes the RESTORE 760 a little pointless.

Why clear the screen in line 250? It's just been cleared in line 230 – or would have been if it weren't for a little point mentioned in the next section.

But why clear it at all in PROCinit, when PROCinstructions is about to clear it again without further ceremony?

Miscellaneous points

PRINT takes as many arguments as you like, up to the end of a 240 character line. That means we can PRINTTAB(5,2); HITKONG%; TAB(16,2); SCORE%;TAB(23,2); SHEET%;TAB(29,2). Much better than repeating the PRINT command before every TAB.

GET stops the program until a key

```
PROCinit: PROCinstructions
REPEAT
  PROCsetup: REM Which calls scoreboard, fanfare, and heli.
  REPEAT
    PROCrock: REM Unplot the rock, then replot or throw it.
    PROCplayer: REM Essentially PROCcheckkeys.
    IF FNhit THEN PROCexplosion
  UNTIL exploded
UNTIL finished
END
```

has been tapped. So REPEAT UNTIL GET −1 has exactly the same effect as dummy=GET. There will be no repetition involved.

When a SOUND command is issued with a value like &1001, it means that a dummy note is to be played, at no volume, overlapping the release of the previous note in the same channel. The purpose of this is to ensure that the next non-dummy note doesn't interrupt the release.

Issued at the end of a piece of music it has no effect at all, because there is no next note. When envelopes are not being used it has no effect at all, because the notes don't have a release phase. And a dummy note of zero duration wouldn't overlap a lot anyway.

What's the moral here? I suppose it's something like "Before you use a facility, run little test programs to make sure that it does what you think it does."

Returning to the instructions on error is all very well for a running program, but can be rather depressing during the debugging. A more useful trap would be along the lines of ON ERROR IF ERR=17 THEN GOTO 50 ELSE REPORT: PRINT ERL.

This still treats ESCAPE as a request for instructions, but reports any other error as expected.

There is a misprint in the User Guide which I imagine has caused a lot of anguish among programmers. The VDU statement which turns the cursor off should have a semi-colon at the end: VDU23;8202;0;0;0;

If the semicolon is missed, the system will still want one more byte to complete the command, and will just take the next byte sent to the VDU drivers.

In line 230, that next byte is a VDU12, under the guise of CLS. Try typing VDU23;8202;0;0;0: CLS directly into the computer, and you will see that the cursor has indeed been turned off, but that the CLS has failed. Not very nice, that.

I know it would be very easy to interpret this article as a condemnation of the King Kong program, so I re-emphasise the wrongness of that interpretation.

I liked the program and I liked the game. I simply saw it as a good opportunity to make a few suggestions which might lead most of us to a better way of programming. But what is better programming? Surely you can't get any better than a program which works as required? I think you can.

I think you can get a program which works faster where speed is required by avoiding unnecessary repetition. I think you can get a program which takes up less memory, leaving more room for expansion.

And I think you can get a program which both you and others will find easier to read and understand, and thus easier to debug and modify.

That's not a bad reward for learning to program the way you think!

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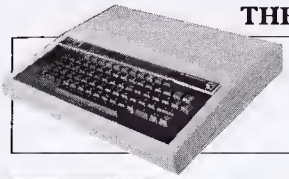

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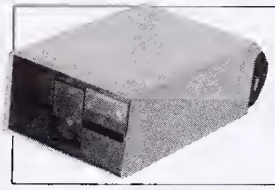

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April Issue

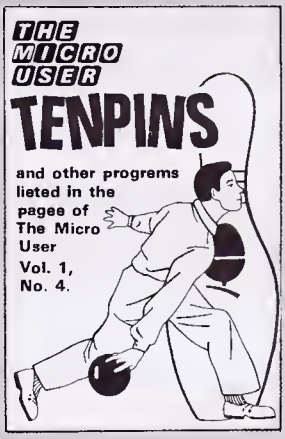
KING KONG, e fast moving game in which you pilot a helicopter to rescue girls perched on the Empire State Building before killing Kong; **GRAPHICS,** e suite of colourful demonstration programs; **NIM,** a structural game of strategy; **TOKENS,** first steps in unravelling the Basic ROM; **HOROSCOPES,** a fun program with useful error-trepping routines; **FORMATTER,** an essential disc utility; **OISASSEM,** a full machine code disassembler; **HEAT & LIGHT,** two measuring and plotting programs.

May Issue

AIR STRIKE, a fast end furious arcade game; Test your mental powers with **PELMANISM;** 25 **ANAGRAMS** for you to solve; **CHARACTER,** to generate vertical and inverted text; **TELETEXT,** animation in Mode 7, really brings the screen to life; **LAB,** a trio of programs to interface laboratory equipment; 10 programs to investigate the **OSBYTE** routine; **BEEB,** two joystick exercises; plus more **COLOUR** and **GRAPHICS** routines.

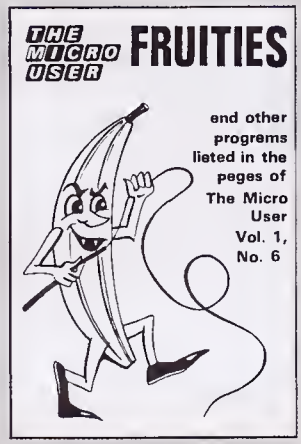
June Issue

SPACE PILOT, lost in spece with dwindling fuel supplies, you must fight off repeated attacks from alien life forms. To replenish fuel, you have to perform e tricky docking menoeuvre, while to repeir the inevitable damage you must land on a mountainous planet. **NOMISM,** you ere a nomadic herdsmen desperetely trying to eke out a living on the plains of Africa. Cen you survive drought, tsetse fly and other hazards? **PLUS** other listings from the June issue.



July Issue

TENPIN, a highly entertaining simulation of Tenpin Bowling; **SPACEPODS,** Try to beat alien hordes; **CUP,** Exciting techniques to bring 3D graphics to the BBC Micro; **SCRSAVE** end **CSRLOAO,** Two programs to allow you to save and load screens to tape or disc; **TEST** and **STEAOY,** A pair of programs to accompany the Beeb body Building Course; **BREAKFIX,** Don't let the Break key destroy all your precious variables! **FORMAT,** Creetes neater listings.



August Issue

FRUITIES, driven by strange urges you climb the ladders of edventure to risk all in the gardens of unearthly frights. Can you survive ell the terrors that await you, or will you, too, fall victim to the evil Fruities? A really superb game. **ANIMATION,** a suite of programs that show you how to really bring your screen alive; **CASOISC,** The essential mechine code downloader for your disc system; **PLUS** other listings from the August issue.

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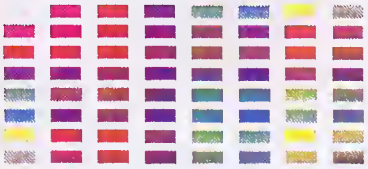

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THE MICRO USER

Part 3

Guide to Software for the BBC Micro

GAMES

Continued from last month

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Arcade Action	Four arcade type games, Snake, Invaders, Breakout, Dodgems.	●	●		●		£11.90	Acornsoft
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Bomb Alley	3D Falklands Battle simulation (machine code hi res graphics).		●	●	●		£7.95	Software Invasion
Bomber Scramble	The original and most effective scramble published.		●	●	●			Kensas
Bug Bomb	A skin tingling new arcade game.		●	●	●		£7.95	Virgin Games
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Castle of Riddles.	Adventure takes place in a castle.		●		●	£11.50	£9.95	Acornsoft
Chess	Chess playing and program solving program.		●	●	●	£11.50	£9.95	Acornsoft
Cosmic Fighter	A fast action multi screen arcade game.		●	●	●			Kenses City
Countdown to Doom	Science fiction adventure.		●		●	£11.50	£9.95	Acornsoft

Title	Description	Model A	Model B	Joystick	Keyboard	Price Disc	Price Cassette	Supplier
Oracula Island	A traditional adventure game. Ideal for starters.		●		●			Kansas
Oraughts & Reversi	Play two board games against the computer.	●	●	●	●	£11.50	£9.95	Acornsoft
F for Freddie	One of the hardest games you will ever play.		●		●			Kansas
Galactic Firebird	One of the most active arcade games on the market today.		●	●	●			Kansas
Hopper	Hop a frog across a road and river.		●	●	●	£11.50	£9.95	Acornsoft
Landfall	An exciting and realistic spaceship landing simulator.		●		●		£7.95	Virgin Games
Magic Adventure	A wonderful colourful magic adventure for children.		●		●			Kansas
Meteors	Shoot meteorites.		●		●	£11.50	£9.95	Acornsoft
Missile Base	Oefend your cities from attack.		●	●	●	£11.50	£9.95	Acornsoft
Monsters	Trap monsters by digging holes and filling them in.		●		●	£11.50	£9.95	Acornsoft
Philosopher's Quest	Unusual adventure.		●		●	£11.50	£9.95	Acornsoft
Planetoid	Return life forms to the planetoid.		●		●	£11.50	£9.95	Acornsoft
Ring of Time	Traditional adventure game, but more involved than Oracula Island.		●		●			Kensas
Rocket Raid	Fly a rocket ship through caves.		●		●	£11.50	£9.95	Acornsoft
Sliding Block Puzzles	Picture Puzzles.		●		●		£9.95	Acornsoft
Snake	Level after level of difficulty makes this one of the best available.		●	●	●			Kansas
Snapper	Snapper eats dots in a maze.		●	●	●	£11.50	£9.95	Acornsoft
Snooker	Realistic simulation for two players.		●	●	●	£11.50	£9.95	Acornsoft
Space Adventure	A graphic adventure set on a seemingly abandoned ship drifting through space.		●	●	●		£7.95	Virgin Games
Space Lab	An involved thinking man's game.		●	●	●			Kansas
Sphinx Adventure	Classic adventure.		●		●	£11.50	£9.95	Acornsoft
Super Invaders	Space Invader type arcade game.		●		●	£11.50	£9.95	Acornsoft
Trafalgar	Ships of the line doing battle at sea.		●	●	●		£7.50	Squirrel
Unoriginal Games	Four basic programs, Pucman, Nightmare Park, Blockade and Rockfall.	●	●		●		£2	David McKeran
Zany Kong	Run along girders, climb ladders and leap barrels to rescue the maiden from Kong.		●	●	●	£9	£6.50	Solar Soft
Starship Command	Oefend command ship from attack.		●	●	●	£11.50	£9.95	Acornsoft

UTILITIES

Continued from last month

Title	Description	Model A	Model B	Joystick	Keyboard	Price Disc	Price Cassette	Supplier
Append It	Splices any number of basic programs together. Auto renumber etc.				●	£5	£3	Aztec
Beebsynth	Oefine and save 16 envelopes and use in the keyboard section. Allows you to play tunes.	●		●	●	£10.95	£7.95	Clares

Title	Description	Model A	Model B	Joystick	Keyboard	Price Disc	Price Cassette	Supplier
Towers	Builds adjacent towers to demonstrate difference between odd/even numbers for very young.	●		●			£4.85	Bryants
Towns of Britain	Questions on over 40 major towns. Hi res map of Britain. Colour and sound.			●		£8.50	£6.50	Aztec
Treasure Hunt	Search a grid and follow clues using the 4 major compass points to find the treasure.	●		●			£6.90	Kingfisher
Tree of Knowledge	Simple educational database.	●		●		£11.50	£9.95	Acornsoft
Word Hunt	Primary Language	●		●		£15.35	£11.90	Acornsoft
Word Sequencing	Primary Languge.	●		●		£15.35	£11.90	Acornsoft
Wordfrog	Program to assist spelling.						£7.50	Educated Owl
Prknna	Molecular biology nearest neighbour frequencies.	●		●				CPE

BUSINESS

Continued from Part 1

Title	Description	Model A	Model B	Joystick	Keyboard	Price Disc	Price Cassette	Supplier
Oesk Oiary	Address book and planner.				●		£9.95	Acornsoft
Graphs and Charts	Library of routines for graph plotting.	●			●		£9.95	Acornsoft
Meditor	Tape based word processor for Epson printers with option for 80 column screen.				●	●	£12	MEO

LANGUAGES

Continued from last month

Title	Description	Model A	Model B	Joystick	Keyboard	Price Disc	Price Cassette	Supplier
BCPL	Structured programming language comprising ROM, disc manual		●		●	£99.65		Aztec
Forth	Full implementation to 79 standard with graphics and assembler		●		●	£19.90	£16.85	Aztec
Lisp	Full interpreter with demonstration program		●		●	£19.90	£16.85	Aztec

GRAPHICS

Continued from Part 1

Title	Description	Model A	Model B	Joystick	Keyboard	Price Disc	Price Cassette	Supplier
Creative Graphics	Routines to demonstrate graphics techniques on the BBC Micro	●	●	●	●		£9.95	Acornsoft
Perspective	Any shape drawn produces 30 perspective.	●	●	●	●	£8.50	£6.50	Aztec

DOMESTIC

Continued from last month

Title	Description	Model A	Model B	Joystick	Keyboard	Price Disc	Price Cassette	Supplier
Personal Accounts	An ideal personal bookkeeping system.				●			Kansas City

Title	Description	Model A	Model B	Joystick	Keyboard	Price Disc	Price Cassette	Supplier
Norm	Statistics, generates normally, distributed random numbers.	●		●				CPE
Number Balance	Primary Maths.	●		●		£15.35	£11.90	Acornsoft
Orgam	Chemistry, identification of organic compounds.	●		●				CPE
PG027	Chemistry, generates random problems in naming alkyl derivatives.	●		●				CPE
PG035	Chemistry, generates random problems on volumetric analysis.	●		●				CPE
Paenam	Chemistry, IVPAC naming of aliphatic organic compounds.	●		●				CPE
Peeko Computer	Microprocessor simulation.			●			£9.95	Acornsoft
Picture Spell	A word/picture recognition program involving spelling and reading.	●		●			£5	GED
Punctuation 1 & 2	Covers explanations, examples and tests on all punctuation.	●		●			£4.B5	Bryants
Q	Queueing theory.	●		●				CPE
Road Safety	For young pedestrian or bike users, animated situations.	●		●			£4.B5	Bryants
Robotic Sums	An arithmetic game for two people involving addition or subtraction at 3 levels.	●		●			£4.50	GED
Sentan	Sentence analysis, parts of speech.	●		●				CPE
Sentence Sequencing	Primary Language.	●		●		£15.35	£11.90	Acornsoft
Sentence Shaker	Unjumble the words to find the sentence.	●		●			£4.5D	GED
Sentence Starter	Choose correct answer for appropriate space, either language or mathematical.			●			£9.50	Educated Owl
Space Recognition	Shapes program for the young. Involves matching rectangles and incomplete squares.	●		●			£4.5D	GED
Shapes Package	Includes shape recognition and rectangular raid	●		●			£B	GED
Speed and Light	Primary science.	●		●		£15.35	£11.9D	Acornsoft
Spelltest	Over 600 Schonell vocabularies available or create your own lists.	●		●			£4.B5	Bryants
Stoic	Chemistry, random problems in stoichiometry.	●		●				CPE
Storybuilder	For imaginative retelling between 3 fairy tales.	●		●			£4.B5	Bryants
Submarines	Find the submarines using simple coordinate geometry and the clues.	●		●			£4	GED
SuperSpell	9 separate sections of 20 words on each, amended. Hangman type graphics.	●		●		£7.50	£5.5D	Aztec
Tables	Tests and aids any table to 20. Builds graphical reward or lists table.			●			£4.85	Bryants
The Garden	Three programs that use superb graphics to help children with colours, spelling and recognition.	●		●			£6.95	Clares
Timeman One	Attractive and motivating program to teach children to tell the time.	●		●		£10.9B	£B.97	Bourne

Title	Description	Model A	Model B	Joystick	Keyboard	Price Disc	Price Cassette	Supplier
C	Improved CAT program which gives the size of each file address.		●	●	●	£3		Baksoft
Catalogue	Improved version of CAT for discs, giving length and details of space on disc.	●		●	●		£4	Baksoft
Character Formatter	Enables the use of user defined character to be easy.			●			£3	Beebsoft
DOS Utilities	Formats and varifies 4D or B0 track discs. Allows use of cheaper drives.			●		£15		Carvells
Data File	The all singing, all dancing data file.	●		●				Kansas
Disk	Disc utility to enable 57 files to be used.	●		●		£12		Carvells
Enhancer	Allows more than 31 files per disc by creating 2 catalogues.							Carvells
Joystick Utility	Converts non joystick programs to run with joysticks.	●					£5	Clares
Library Classification	Contains 750 topics, easy to add more, will take over 1000, with average search time of 3 seconds.	●		●		£8.5D	£6.50	Aztec
Library Dewey	Contains 750 topics. Easy to add more. Will take well over 1,000.	●		●		£B.50	£6.50	Aztec
MasterCopier	Copies machine code tapes. Two keys to press.			●			£6.50	Aztec
R	Program which allows the user to recover a deleted Basic file.	●		●	●	£5		Baksoft
Recover	A utility to recover accidentally erased Basic fiies from disc.	●		●	●		£6	Baksoft
Replica	Allows most machine code and basic programs to be uploaded to disc.	●		●		£9.95		Clares
Terminal Emulator	Enables the user to talk to other computers and mainframes via RS423.	●		●	●	£16.D0		Carvells
XT, X	Program system which allows the user to store up to 145 files on each side of each disc.	●		●	●	£6		Baksoft

EDUCATION

Continued from last month

Algebraic	Four algebraic manipulation and reduction programs.			●			£9.95	Acornsoft
All Fingers Go	Ultra fast touch typing. Ten lessons from beginners to full keyboard typing. Two cassettes.	●		●			£14.95	NEC
Bact	Biology simulation of growth of a culture of bacteria under 3 conditions.	●		●				CPE
Business Games	Stock market and management games.			●			£9.95	Acornsoft
Cat and Mouse	Practice arithmetic at various levels against the clock. Will the mouse reach the cheese?	●		●			£6.9D	Kingfisher
Chain	Simulation of nuclear decay.	●		●				CPE

Title	Description	Model A	Model B	Joystick	Keyboard	Price		Supplier
						Disc	Cassette	
Catchapple	A fun way to practice multiplication tables. Correct answers must be picked from a tree.	●		●			£6.90	Kingfisher
Charge	Physics / simulation of Millikan's oil drop experiment.	●		●				CPE
Chemical Analysis		●		●		£17.25	£13.80	Acornsoft
Chemical Simulations		●		●		£17.25	£13.80	Acornsoft
Chemical Structures		●		●		£17.25	£13.80	Acornsoft
Chords	4 separate sections. Instructs and tests in the use of written and played musical chords.	●		●		£8.50	£6.50	Aztec
Chroma	Chemistry, chromotography.	●		●				CPE
Claws	Claw starts travelling once mental arithmetic option chosen and displayed.			●			£4.85	8ryants
Cloze	Interpret the passage and add the missing words.	●		●			£4.50	GED
Cloze Procedure	Follows Bullock report recommendations, five passages which can have selected words.	●		●			£4.85	8ryants
Comatch	For pre school children, but loved by adults. Animation and Mode 7 holds their attention.	●		●			£4.95	Cleres
Compass	A directions program starting with up, down, left, right.	●		●			£4.50	GED
Contf	Continuous flow calorimetry simulation.	●		●				CPE
Count	Physics study of merits of different counting systems for various isotopes.	●		●				CPE
Counting	Excellent graphics engage the childs interest whilst learning to count. Number up to 20.	●		●			£4.95	Clares
County (SW/SM)	Draws southern counties in colours with main towns or rivers.	●		●			£4.85	8ryents
Crocodiles	Tame croc can be released to catch odd/even number, wild crocs punish.	●		●			£4.85	8ryants
Crossed Words	5 separate sections, 100 letters in each. Topics are animals, colours, red indians, flight, family.			●		£8.50	£6.50	Aztec
Dataquiz	Utility for creating unlimited multiple choice question, answers end explanations.	●		●			£4.85	8ryants
Density and Circuit	Primary science.	●		●		£15.35	£11.90	Acornsoft
Dval	Chemistry, X ray diffraction.	●		●				CPE
Early Num	Demonstrates and tests on ordinal numbers in words and figures.	●		●			£4.85	8ryents
European Studies	High res map. 14 countries, 14 towns in each. Lot of questions.	●		●		£8.50	£6.50	Aztec
Farm	Program to study the effects controlling the management of an arable farm.	●		●				CPE
Fizz Buzz	Tables reaction game for two people.	●		●			£4.50	8ourne
Forder	Investigation changes in concentration of a reactant when it undergoes a first order reaction.	●		●				CPE

Title	Description	Model A	Model B	Joystick	Keyboard	Price		Suppliar
						Disc	Cassette	
Fraction Chase	A game for 2 people. Answer the question correctly, shake the dice, then move around the board.	●		●			£4	GED
GCE Maths (O)	Revision Tape 2. Covers questions, explanations on standard form, significant figures, geometry.	●		●			£9.50	8ryents
GCE Maths (O)	Revision Tape 1. Covers questions, explanations on typical exam syllabuses.	●		●			£9.50	8ryents
German Sentence Practice	First program, a series of pictures to teach phrases. Second program cloze type phrases learnt.	●	●	●	●		£9.50	Educeted Owl
Graphs (Arit)	Demonstrates histograms, polygonal and pie graphs which can be reused.	●		●			£4.85	8ryents
Happy Numbers	Full colour graphics, number recognition and counting. For 4/6 year olds.	●		●		£10.98	£8.97	8ourne
Intro	A logo like language that uses turtle graphics to introduce programming concepts and techniques.	●		●			£7.95	Cleres
Jars		●		●		£15.35	£11.90	Acornsoft
Jumbled Letter	Unjumble the letters faster than your opponent.	●		●			£4	GED
Jumbles	Simple (junior level) sentences need reassembling from random order boxes.	●		●			£4.85	8ryents
Junior Maths	5 levels of difficulty, 3 separate sections. Correctly set out one under the other.			●		£5	£3	Aztec
La Princesse	All instructions and responses in French. Very involved maze with graphics and sound.	●		●		£8.50	£6.50	Aztec
Look It Up	Provides practice in placing words in alphabetical order. Two levels offered.	●		●			£4.50	GED
Malaria	Simulation of attack, phase treatment of a malaria epidemic.	●		●				CPE
Mark 8ook	Teachers Mark 8ook program for 40 pupils.	●		●		£18	£15	8eebsoft
Massdef	Chemistry, compares relative stability of different isotopes of the same element.	●		●				CPE
Matching	Four programs covering word, shapes, patterns, numbers. Ideal for pre school and infants.	●		●			£5.95	Cleres
Maths Man	An erithmetic game for one, involves eddition, subtraction and multiplication, at 3 levels.	●		●			£4	GED
Microtype	The recognised standard in typing tutors.	●		●				Kenses
Signs	Primary Maths.	●		●		£15.35	£11.90	Acornsoft
Money 8ox	Shopkeepers arithmetic, multi or subtraction, add on option.	●		●			£4.85	8ryents
Monster Maze	Have fun finding the way out of the maze and practice arithmetic at the same time.	●		●			£6.90	Kingfisher
Morse Code Fun	Audio and written morse. Lots of key words.			●		£5	£3	Aztec
Musical Numbers	Continuous music and generated matching graphics with ordinal numbers (1 to 10).			●			£4.85	8ryents

The garden of unearthly frights..

With apologies to H. Bosch

ONCE upon a time there was a garden, one of many levels connected by steep and hazardous ladders. In this high and airless garden grew wild and mysterious fruit, tempting and tasty.

Yet many perils awaited those who sought it. Some perished from lack of oxygen. Others died in terror as they found that the object of their desires – the fruit they'd sought so long – attacked them viciously.

Yet still people came, perhaps driven mad by craving for the deadly fruit, perhaps just to test their foolish courage. Still they sought to reach the highest levels ... and few survived.

Are you brave enough to scale the ladders and survive the fruity encounter? Your only chance is to dig holes through the levels and trick the little devils into falling through. Instructions are given in the game, but first a few hints:

- Don't stay in the same place too long.
- Dig holes fast and deep and hit the fruits before they get time to crawl out.
- Watch out for the ultimate horror – an overgrown mango, which appears at the higher skill levels. It is deadly. The only way you can beat it is to drop it through all five levels.

Oh yes, you've got three lives. You'll need them.

→

Fruities

From Page 59

PROCEDURES

PROCinit: Dimensions arrays – sets high score, sets up user defined characters sets up envelopes.

PROCheader: Sets up title screen header.

PROCtitles: Sets up display of control keys.

PROCinstruct: Displays scenario.

PROCmove: Animates man.

PROC man move: Checks keyboard and takes appropriate action, checks if man is over a hole or if man is over a trapped Fruity.

PROCdig: Checks which direction man is facing and selects the correct dig procedure.

PROCdig_right: Dig a hole to the right of current position. Or fill in hole if Fruity is trapped there.

PROCkill_right: Decides which Fruity has been hit.

PROCdig_left: As for PROC dig_right.

PROCkill_left: As for PROC kill_right.

PROCfall: Drops the man through a hole and checks that he has not dropped on a Fruity.

PROCdead: Subtracts one man. Displays headstone. If no lives remaining – PROCend. Get ready for next sheet.

MAJOR VARIABLES

A%, B%, C%, D%	Used for point testing of brickwork.
F%	Distance required to kill a falling Fruity.
H%	Displayed colour of Fruities.
I%	Score to date while Fruity is falling.
K%	Ascii value of last key pressed.
N%	Used as an array pointer to indicate Fruity co-ordinates being accessed (also used as a loop counter).
O%	Amount of oxygen remaining.
Q%	Number of Fruities on present sheet.
R%	Logical colour of ladders.
V%	See AX% (N%)
W%	See AY% (N%)
X%	X position of man.
Y%	Y position of man.
Z%	Used as a pointer of the man's Y position.
AX% (N%)	Fruity (N%)'s X position.
AY% (N%)	Fruity (N%)'s Y position.
MX% (N%)	Fruity (N%)'s X vector (direction and speed of travel).
MY% (N%)	Fruity (N%)'s Y vector (direction and speed of travel).
NCAR%	Man's new display character.
OCAR%	Man's old display character.
OLDAX% (N%)	Fruity (N%)'s old X position.
OLDAY% (N%)	Fruity (N%)'s old Y position.
MAN%	Number of lives remaining.

YOU score points by trapping the aliens, or "Fruities", in holes and filling them in before they crawl out. You will meet:

Strawberry	Red	100 Points	Level 1
Gooseberry	Green	200 Points	Level 2
Banana	Yellow	300 Points	Level 3
Bilberry	Purple	400 Points	Level 4
Mango	Cyan	500 Points	Level 5

As you clear each sheet more Fruities will appear until you kill three of them, after which you return to one. This is of a tougher variety. Dropping a Fruity through more levels scores more points.

PROCend: Displays end message.

PROCoxygen: Calculates and displays current oxygen level.

PROCaliens: Calculates new Fruity positions. Checks if they fall into hole or fills partially dug hole.

PROClevel: Decides position of man in relation to Fruities and sets appropriate Y vector (to move them up or down).

PROCamove: Animates each Fruity.

PROCafall: Sets up falling Fruity and fills holes as it passes through them. Decides whether or not Fruity survives.

PROCsplat: Kills Fruity and displays intermediate score for a few seconds.

PROCcrawl_out: Makes Fruity jump out of hole and fills hole in.

PROCdrop: Drops Fruity into hole, shakes it, and checks for time limit before it crawls out.

PROCscreen: Sets up original Mode 2 display.

PROCsheet: Sets initial values at beginning of each new sheet and determines new logical colour of ladders.

PROCbricks: Draws the bricks.

PROCladders: Decides where to put the ladders.

PROCladd: Draws the ladders.

PROCposition: Decides the starting positions and vectors of all three aliens.

PROCerror: Traps escape key. Resets editing keys and keyboard repeat delay if an error is encountered.

Listing starts on Page 93

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This month's offer is another winner — a consignment of 14" R.G.B. colour monitors manufactured by J.V.C. — at prices never seen before in the U.K. Suitable for use with BBC Micro, Lynx, Oric, Apple II, Apple III and IBM etc.

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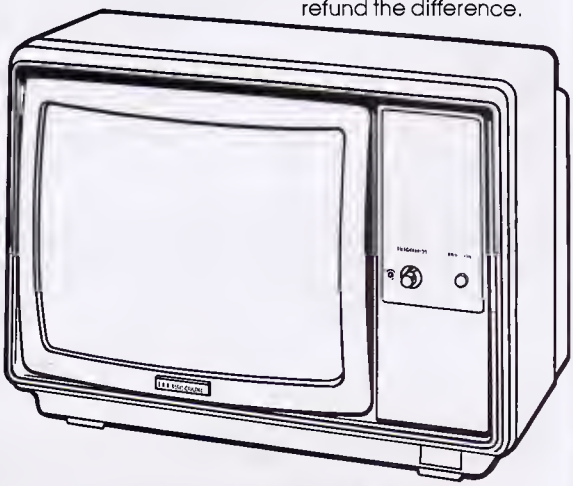

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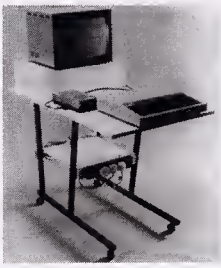

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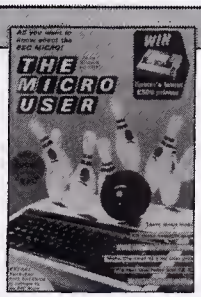

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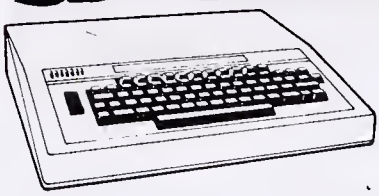

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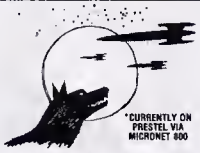

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LOGICAL OPERATORS on the BBC Micro

By ALLEN HARDY

LOGICAL and bitwise operators in BBC Basic, according to the BBC Micro User Guide, are equivalent (Page 205). Unfortunately, therefore, the operators AND, OR and EOR need to be bitwise operators and cannot always be used as logical ones.

Consider the example in Program I (the THEN in line 60 may be omitted). If both conditions in line 60 are true, that is if SIZE is 9 and if WEIGHT is 9, then of course, QUIT is printed, and if one or both of them is/are false the QUIT is not printed.

Here, and in the following examples, printing QUIT serves merely as an acknowledgement – the program is not actually exited. The process, bitwise, used by BBC Basic is first to evaluate both conditions to either TRUE or FALSE separately.

Since the only combination of two of the two logical values TRUE and FALSE which when ANDed can be resolved to TRUE is TRUE AND TRUE, "QUIT" will be printed only if both conditions are true (some understanding of Boolean algebra or logic is required here).

The effect of line 70, incidentally, is to cause the REPEAT . . . UNTIL loop to repeat indefinitely, so the program has to be exited by pressing Escape.

UNTIL 0 (nought) could have been used instead of UNTIL FALSE, since FALSE in BBC Basic has the numerical value 0. (TRUE has the numerical value –1.)

However, if the first condition in line 60 (SIZE=9) were *not* true, then regardless of the result of the second condition (WEIGHT=9), the two conditions together could not give TRUE (because as explained, using AND, only TRUE AND TRUE gives TRUE). This should be clear to anyone able to understand simple logic – bitwise or otherwise.

Yet the second condition is always tested. This can easily be shown by deleting line 50 and running the program again.

Irrespective of whether SIZE is equal to 9, the error message "No such variable at line 60" appears and refers to the variable WEIGHT.

This shows that whatever the result of the first condition, an attempt is made to test the second, which is unnecessary when the result of the first is FALSE (such as when SIZE does not equal 9). Hence the operator AND is not a true logical one.

So what? WEIGHT should be defined anyway, and it doesn't matter whether the second condition is tested. Quite so in this case, but suppose the second condition takes the form of a call to a function which GETs a response from the user, as in the program in Program II.

The function definition, which should also be typed in, is given in Program VIII and some explanatory notes follow later. (Note that only lines 10, 60 and 100 to 200 need be typed to amend the existing code.)

```
   10 REM *** PROGRAM I ***
   20 MODE 7
   30 REPEAT
   40 INPUT "SIZE ", SIZE
   50 INPUT "WEIGHT ", WEIGHT
   60 IF SIZE=9 AND WEIGHT=9 THEN PRIN
T "** QUIT **"
   70 UNTIL FALSE
```

```
   10 REM *** PROGRAM II ***
   20 MODE 7
   30 REPEAT
   40 INPUT "SIZE ", SIZE
   60 IF SIZE=9 AND FNYESNO("WANT TO Q
UIT") THEN PRINT "** QUIT **"
   70 UNTIL FALSE
```

```
   10 REM *** PROGRAM III ***
   20 MODE 7
   30 REPEAT
   40 INPUT "SIZE ", SIZE
   60 IF SIZE=9 THEN IF FNYESNO("WANT
TO QUIT") THEN PRINT "** QUIT **"
   70 UNTIL FALSE
```

Understanding that AND is a logical operator, you may think that the function will be called only when the first condition is true, line 60 being exited when the first condition is found to be false.

Unfortunately, as explained, this is not the case – the function is always called. But unless there is an ELSE clause, replacing AND in line 60 with THEN IF (or just IF since the THEN is optional) will produce the desired effect. See Program III, which differs from Program II in only lines 10 and 60.

This, as you would expect, does cause the remainder of line 60 to be skipped (at least as far as any ELSE clause) if the first condition is false. That is, you are asked "Want to quit?" only when SIZE=9. (An ELSE clause *may* follow, but due to BBC Basic's IF . . . THEN . . . ELSE syntax, it may not be matched with the intended IF.)

This, then, provides us with one solution to unnecessary testing of conditions in an IF statement with any number of conditions and using the operator AND.

Thus, in general,

IF (testable condition 1) AND (testable condition 2) AND . . . (testable condition n) THEN (action)

may be recoded:

IF (testable condition 1) THEN IF

→

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From Page 66

(testable condition 2) THEN IF ... (testable condition n) THEN (action)

This causes the line to be exited as soon as one condition is found to be false without testing of subsequent conditions.

Should the operator be OR, a little more complex recoding is required:

IF (testable condition 1) OR (testable condition 2) OR ... (testable condition n) THEN (action)

may be recoded

IF NOT (testable condition 1) THEN IF NOT (testable condition 2) THEN IF NOT ... (testable condition n) ELSE (action)

This causes the action to take place as soon as one condition is found to be true without testing of subsequent conditions. That is, the line is skipped as far as the ELSE clause.

Try replacing the THEN IF in line 60 of Program III with OR. When SIZE is 9 you will see that again the second condition is tested unnecessarily. But using the new coding suggested above – given in Program IV – no test of the second condition is made when the first is true.

It is essential that SIZE=9 be in brackets, since otherwise the high priority operator NOT operates on just SIZE on account of its having higher priority than "=" (see page 144 of the User Guide).

Note also that just as an ELSE clause is not compulsory, it is not illegal to have no THEN clause. An IF statement with neither clause, however, is pointless.

There is no point in recoding a line using only EOR operators as all conditions must always be tested anyway.

The above arguments may, of course, be extended to IF statements using any combination of the logical operators AND, OR and EOR. It may be necessary, however, to use brackets to override operator precedence.

These methods of preventing unnecessary tests will also reduce execution time, which may be useful in loops.

The problem of preventing unnecessary testing of conditions in other statements – UNTIL for example – becomes a little more difficult.

Suppose you want a game to repeat until either a counter, I, equals 5 or you answer "yes" to the question "Want to quit?" asked at the end of each game.

The program in Program V will not do because even when I is 5 you will still be asked whether you want to quit. Line 60 represents the game and when the word QUIT is printed the program is actually exited.

The program in Program VI provides one solution via a change to line 70 by simply preventing the function call when I=5.

Line 70 in Program VII causes the game to repeat until I=5, when you are asked if you want to quit. Using AND in place of the OR in line 70 of Program 5 would be acceptable only if AND worked logically by not testing the second condition when the first is false.

The function FNYESNO(Q$)

The function in Program VIII may be called from any program whenever a yes or no response is required. It causes its argument to be printed followed by (Y/N) ?, GETs a keyboard character from the user and returns TRUE for "Y" or "y" and FALSE for "N" or "n" and ignores all other characters.

The AND &DF in line 150 converts all Ascii codes for lower case characters to those for capitals (the Ascii codes for N and Y being 78 and 89 respectively).

(A=89) (line 200) has the logical value TRUE if A=89, that is if CHR$(A)="Y", and FALSE otherwise.

Line 180 – REPEAT UNTIL GET=13 – causes the function to wait until the Return key is pressed (13 being the Ascii code for Return). If no such pause is required the line may simply be omitted.

Program IX shows an alternative yes/no function, but due to a bug preventing the use of an ELSE clause in ON ... GOTO and ON ... GOSUB in a function or procedure definition, it may not be used in the first version of BBC Basic. (See note on page 309 of the User Guide.)

```
  10 REM *** PROGRAM IV ***
  20 MODE 7
  30 REPEAT
  40 INPUT "SIZE ", SIZE
  60 IF NOT (SIZE=9) THEN IF NOT FNYE
SNO("WANT TO QUIT") ELSE PRINT "** QUI
T **"
  70 UNTIL FALSE
```

```
  10 REM *** PROGRAM V ***
  20 MODE 7
  30 I=0
  40 REPEAT
  50 I=I+1
  60 PRINT"GAME",I
  70 UNTIL I=5 OR FNYESNO("WANT TO QU
IT")
  80 PRINT "** QUIT **"
  90 STOP
```

```
  10 REM *** PROGRAM VI ***
  20 MODE 7
  30 I=0
  40 REPEAT
  50 I=I+1
  60 PRINT"GAME",I
  70 IF I=5 THEN UNTIL TRUE ELSE UNTI
L FNYESNO("WANT TO QUIT")
  80 PRINT "** QUIT **"
  90 STOP
```

```
  10 REM *** PROGRAM VII ***
  20 MODE 7
  30 I=0
  40 REPEAT
  50 I=I+1
  60 PRINT"GAME",I
  70 IF I=5 THEN UNTIL FNYESNO("WANT
TO QUIT") ELSE UNTIL FALSE
  80 PRINT "** QUIT **"
  90 STOP
```

```
  100 REM *** PROGRAM VIII ***
  110 DEF FNYESNO(Q$)
  120 LOCAL A
  130 PRINT Q$;" (Y/N) ? ";
  140 REPEAT
  150 A=GET AND &DF
  160 UNTIL A=78 OR A=89
  170 PRINT CHR$A;
  180 REPEAT UNTIL GET=13
  190 PRINT
  200 =(A=89)
```

```
  100 REM *** PROGRAM IX ***
  110 DEF FNYESNO(Q$)
  120 PRINT Q$;" (Y/N) ? ";
  130 ON INSTR("YyNn",GET$) GOTO 140,1
40,150,150 ELSE 130
  140 =TRUE
  150 =FALSE
```

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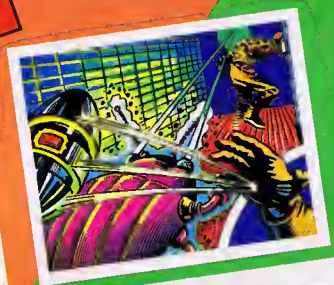

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Colourful brighten up

MODE 7 has many applications as it gives the most user memory of any of the modes on the BBC Micro. The unfortunate disadvantage that I find with this mode is that a colour control character is required at the start of each new line, or the display will remain black and white.

Here I illustrate four simple routines to put coloured characters on the screen. They could obviously also be used to give white letters on a coloured background, and with a little adaptation, coloured letters on a coloured background could be achieved.

There are two restrictions to using any of the routines directly:

- There must be no Printing in column 1 of the screen.
- The screen must not have scrolled since the last clear screen.

All the routines work by putting the colour control character in location &0C00 and in further locations in steps of 40.

Routine 1 is a Basic procedure to illustrate how the method works. The procedure is from lines 1000 to 1050, with lines 10 to 100 calling the procedure to illustrate its use.

The program is self explanatory, with line 1010 adding 128 to X% so that the parameter carried to the procedure is the same number as the function key giving the same colour on the 1.2 OS.

Routine 2 is in machine code to put colour on a quarter of the screen. In LOOP, the X register is incremented and every 40 (counted in LOOP1 by the Y register) the control character is put in location &0C00 indexed by X.

To test the routine, type it in and run it. Then clear the screen by CTRL+L and list the program. If you then type CALLS% the top part of the list should change colour. To alter the colour change line 70 of the program and rerun it.

Alternatively the query indirection operator can be used to change the appropriate byte of memory.

Routine 3 is basically Routine 2 written four times with different starting positions. Test it in the same way as Routine 2, but just list up to line 200 to prevent scrolling.

Routine 4 is Routine 3 adapted to fit in the interrupt routine. This means that the first column of control characters is constantly refreshed and, subject to the two conditions previously mentioned, the screen will remain coloured.

To implement the routine, run it and check that it has assembled starting at &1080 (if it has not, the following will have to be adjusted accordingly). Then the vector pointing to the start of the interrupt must be changed to point to the start of this routine (the routine ends with a jump to the normal interrupt). To do this type:

```
?&204=&80:?&205=&10
```

After this, clear the screen and all further writing should be in colour. To change the colour type ?&1088=n, where n is the appropriate colour code. Note that the memory location will be different if the program assembled starting somewhere other than &1080.

This routine can be removed from the interrupt by typing:

```
?&204=&93:?&205=&DC
```

although any colour already on the screen will remain there.

Note that programs will not load or save with this routine in the interrupt, but they will run satisfactorily, although slowed down slightly.

All these routines have been written so that they can be easily understood by inexperienced programmers and may give all programmers some new ideas.

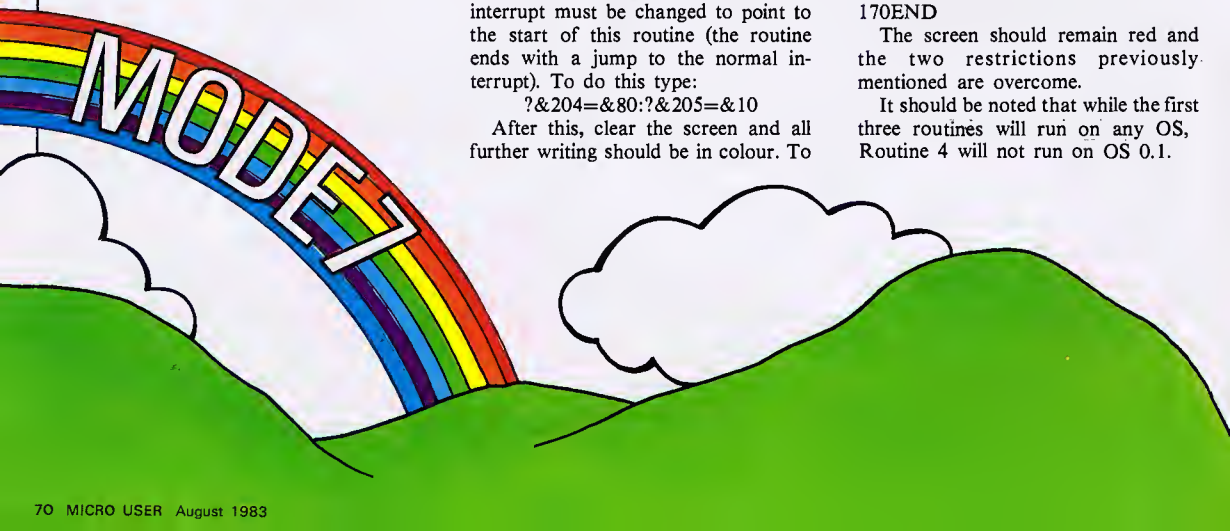
It is hoped that more experienced programmers will use the ideas to write more efficient colour routines of their own.

One easy improvement is to set up a text window to prevent the colour control characters being touched. Try these extra lines in the first routine and test it by typing GOTO140:

```
140CLS
150PROCCOLOUR(1)
160VDU28,1,24,39,0
170END
```

The screen should remain red and the two restrictions previously mentioned are overcome.

It should be noted that while the first three routines will run on any OS, Routine 4 will not run on OS 0.1.



characters your screen

```
  1 REM ROUTINE 1
  2 REM
 10 CLS:INPUT"What colour required (
1-8)",C%
 20 FOR1=1TO160:PRINT" TEST";:NEXT
 30 PROCCOLOUR(C%)
 40 PRINT"PRESS SPACE TO SEE OTHER C
OLOURS"
 50 A=GET
 60 FORcolour=1TO8
 70 PROCCOLOUR(colour)
 80 A=INKEY(200)
 90 NEXT
100 GOTO60
1000 DEFPROCCOLOUR(X%)
1010 X%=X%+128
1020 FOR1%=31744TO32744STEP40
1030 ?I%=X%
1040 NEXT
1050 ENDPROC
```

```
  1 REM ROUTINE 2
  2 REM
 10 DIM GAP% 100
 20 FOR1=0TO3STEP3
 30 P%=GAP%
 35 S%=P%
 40 [
 50 OPTI
 60 CLC
 70 LDA#130 \ PUT COLOUR CODE HERE
 80 LDX#0
 90 .LOOP LDY#40
100 STA&7C00,X
110 .LOOP1 INX
120 BEQ FIN
130 DEY
140 BNE LOOP1
150 JMP LOOP
160 .FIN RTS
170 ]
180 NEXT
```

```
  1 REM ROUTINE 3
  2 REM
 10 DIM GAP% 100
 20 FOR1=1TO3STEP2
 30 P%=GAP%
 35 S%=P%
 40 [
 50 OPT1
 60 CLC
 70 LDA#130 \ PUT COLOUR CODE HERE
 80 LDX#0
 90 .LOOP LDY#40
100 STA&7C00,X
110 .LOOP1 INX
120 BEQ FIN
130 DEY
140 BNE LOOP1
150 JMP LOOP
160 .FIN LDX#0
170 .LOOPA LDY#40
180 STA&7CF0,X
190 .LOOPA1 INX
200 BEQ FINA
210 DEY
220 BNE LOOPA1
230 JMP LOOPA
240 .FINA LDX#0
250 .LOOPB LDY#40
260  STA&70E0,X
270 .LOOPB1 INX
280 BEQ FINB
290 DEY
300 BNE LOOPB1
310 JMP LOOPB
320 .FINB LDX#0
330 .LOOPC LDY#40
340 STA&7E00,X
350 .LOOPC1 INX
360 BEQ FINC
370 DEY
380 BNE LOOPC1
390 JMP LOOPC
400 .FINC RTS
410 ]
420 NEXT
```

```
  1 REM ROUTINE 4
  2 REM
 10 DIM GAP% 100
 20 FOR1=1TO3STEP2
 30 P%=GAP%
 35 S%=P%
 40 [
 50 OPT1
 51 SE1
 52 PHA
 53 TXA:PHA
 54 TYA:PHA
 60 CLC
 70 LDA#130 \ PUT COLOUR CODE HERE
 80 LDX#0
 90 .LOOP LDY#40
100 STA&7C00,X
110 .LOOP1 INX
120 BEQ FIN
130 DEY
140 BNE LOOP1
150 JMP LOOP
160 .FIN LDX#0
170 .LOOPA LDY#40
180 STA&7CF0,X
190 .LOOPA1 INX
200 BEQ FINA
210 DEY
220 BNE LOOPA1
230 JMP LOOPA
240 .FINA LDX#0
250 .LOOPB LDY#40
260  STA&70E0,X
270 .LOOPB1 INX
280 BEQ FINB
290 DEY
300 BNE LOOPB1
310 JMP LOOPB
320 .FINB LDX#0
330 .LOOPC LDY#40
340 STA&7E00,X
350 .LOOPC1 INX
360 BEQ FINC
370 DEY
380 BNE LOOPC1
390 JMP LOOPC
400 .FINC PLA:TAY
401 PLA:TAX
402 PLA
403 JMP &0C93
410 ]
420 NEXT
```

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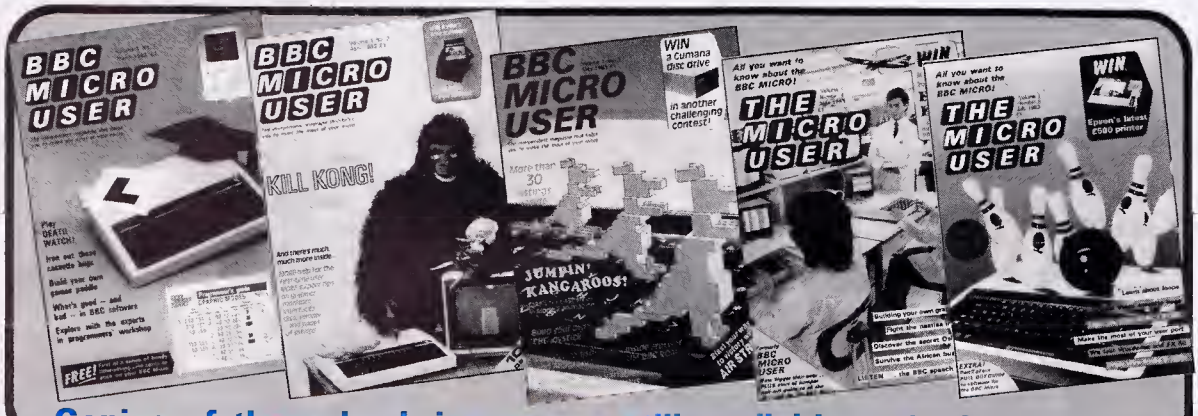

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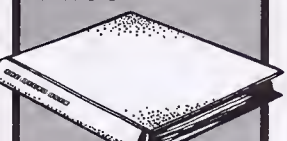

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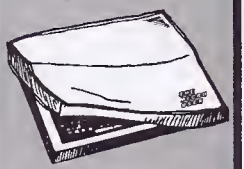

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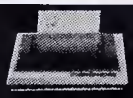

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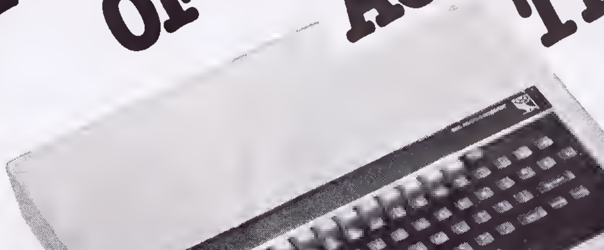

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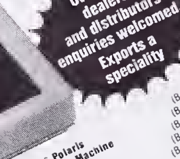

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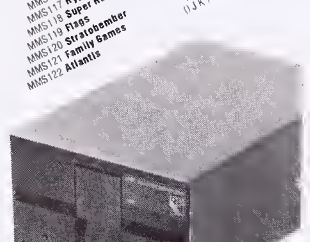

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THE BEEB BODY BUILDING COURSE

By MIKE COOK

HAVE you ever seen those science fiction films where the hero is confronted by an all-powerful computer controlling every aspect of the planet's environment and defence? Said hero then has to outwit the computer before the credits roll and you can all go home.

He does this by asking some enigmatic question like "How?" or "Why?" at which the whole machine starts to smoulder and smoke before it bursts into flames, showering sparks all over our retreating hero.

As those of us with computers well know, if we try this sort of thing what actually happens is the computer answers with SYNTAX ERROR or MISTAKE – a little easier on the hardware, if a trifle dull.

This month we shall see how you can control external devices with your computer and, if you are brave enough, really put the wind up the next person perpetrating an error.

The simplest way of getting the BBC Micro to control devices is through the user port. Last month we saw how we could access this easily using the transition board, and this will be needed for this month's exercises as well.

When the user port is used as an output it gives a signal of 0 volts or +5 volts. This is sufficient for controlling many devices, but the output cannot be used directly. The reason is that the VIA which constitutes the user port can only supply about 1.5 mA, and so this current has to be amplified before it can accomplish anything useful.

As we are not increasing the voltage available but only the current, this type of amplifier is sometimes called a buffer, which is actually an impedence matching circuit.

As the VIA can only supply a small current, we say it has a high output impedence. Some devices, like relays for example, may require a large current to drive them and so are said to have a low input impedence.

Therefore a buffer is used as it can convert a high impedence signal into a low impedence signal.

The type of buffer required depends on the device you are controlling and its impedence. For the purposes of this article, impedence can be considered to be the same as resistance.

Let's look at a practical example to see what I mean. One of the devices you might want to control is an indicator light, and a very convenient type is a LED, or Light Emitting Diode (see Figure I). This has quite a high impedence, but not high enough for us to dispense with a buffer.

Typically, a LED will need 10 mA flowing through it to give adequate brightness. In addition, when the LED is on it will have about 1.6 volts across it (this is for a red LED – other colours

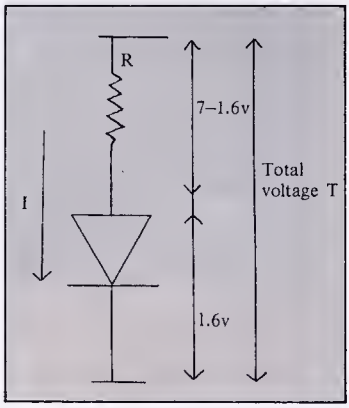


Figure I: Voltage and currents on an LED

From Page 79

have 2.7 volts). Therefore to drive this from 5 volts we need a resistor to limit the current.

Ohms law states that E=I*R, where E=voltage in volts (using V would be just too easy), I=current in amps (see comment on E) and R=resistance in ohms.

With this formula you can work out the value of resistor needed for the LED. The resistor has (5–1.6) volts across it and 10 mA (0.01 amps) flowing through it, and so we need a resistor of 340 ohms.

After all that calculation we find that they do not make a 340 ohm resistor, and so we have to settle for the nearest standard value of 330 ohms.

This may seem a little strange, but a lot of electronic design is based on careful calculation and then gross approximation. In this case the approximation was made in how much current is needed. The more current the brighter the LED, until finally it burns out. Most LEDs are rated at 20 mA, and so you see the resistor value is not at all critical.

Having arrived at this arrangement how can we control it? There are two basic methods. One is to source the current and the other is to sink it.

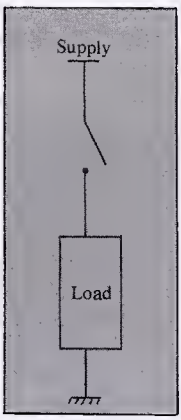


Figure IIa: Source current

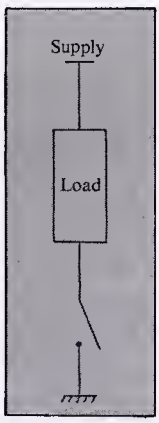


Figure IIb: Sink current

This is like a tap and a plug in a bath. A tap will source water and a plug hole will sink water. In both water is flowing.

You can draw a parallel between water and current, for both flow along a circuit. To see how current can be sourced or sunk look at Figures IIa and IIb. In each, the controlling device is shown as a switch. If it were indeed a switch there would be no difference between the two circuits.

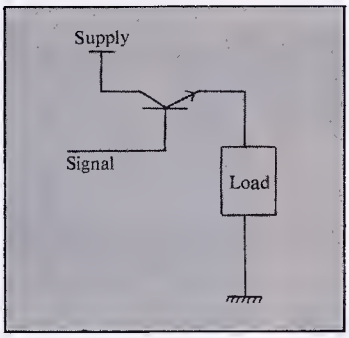


Figure IIIa: Source switch

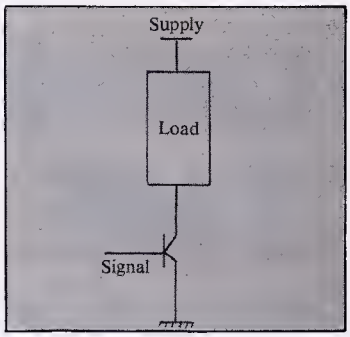


Figure IIIb: Sink switch

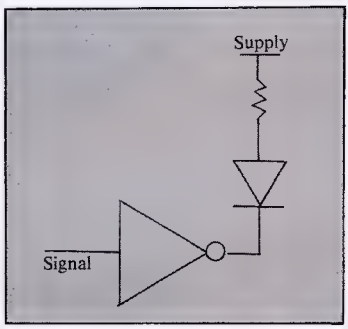


Figure IV: LED driven from buffer

We need a switch we can control, and typically that means a transistor. This produces the two methods of control shown in Figures IIIa and IIIb. The second method is the preferred one. (You might know it would be as it is not the one you would expect!)

The advantages of sinking current over sourcing current is that there is a 0.7 volt drop across the base emitter of a transistor, and so this would limit the available voltage.

This is important because not all logic devices give 5 volts as a logic one. Some give as low as 3 volts.

Also many TTL devices (Transistor Transistor Logic) have what is known as an open collector output. That is, the collector is the output connection and the emitter is connected to the 0 volt line.

If just a single LED is needed then it is possible to use the circuit in Figure IIIb, but a much more economical approach is to use an open collector TTL buffer.

Figure IV shows the LED being driven from a buffer. The device 74LS05 has six such buffers in it and should cost less than 20p.

Figure V shows the relationship between the buffers and the pins. Note that these are inverting buffers, and so a logic one will turn on the output transistor (closing the switch) and the LED will light, just as we would expect.

Well, that is one piece of extra hardware wired up. Now what is needed in the way of software to control it?

The first thing we need to do is

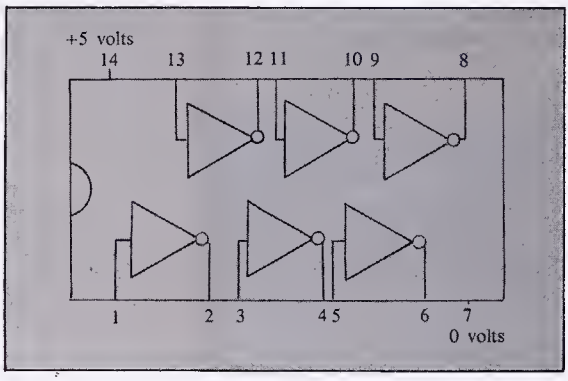


Figure V: Pinout of 74LS05 buffer

THE BEEB BODY BUILDING COURSE

program the VIA to tell it which bits are going to be used as outputs.

As we saw last month, the register that controls this is called the Data Direction Register, and is located at address &FE62 (remember that "&" indicates a hex value).

For each bit on the user port which we want to use as an output we must store a logic *one* in the corresponding bit in the data direction register.

For example, suppose we want to use bit 4 to control our LED, then we store the bit pattern 00010000 (&10) at address &FE62.

This can easily be done using the indirection operator. Thus the command ?FE62=&10 would set bit 4 as an output and all the rest as inputs. (Note that this does not work over the Tube. See my comments last month on this.)

This setting up or initialisation need only be done once at the start of a program or session. However, whenever the break key is pressed this will initialise the VIA so that all the bits are inputs.

You can reprogram the break key so that the user port is initialised the way you want and so avoid this problem.

When a bit is initialised as an input and you have connected it up as an output you will have the effect of a permanent logic *one* output.

Many external devices are the simple on/off type and so we only need to store a *one* at the appropriate bit for it to turn on. Likewise, to turn it off, we need only store a logic *zero* in the bit.

The problem comes when there is more than one output, because any write to the user port affects all the outputs at once. What we need is a method of altering only the bit we want while leaving the rest of the outputs unchanged.

To do this you first need to read the value currently on the outputs by using the indirection operator on the left hand side of the equals sign.

Next, only the bit you want to change must be altered and that value then written back to the user port.

The instructions you need to change a bit are the logical operators AND, OR and Exclusive OR. Each one changes bits in a different manner.

These can best be understood by looking at a few examples.

We will define the byte (8 bits) we want to change as "the word" and the number we use to change it as "the mask". So in our case the word will be the result given by the instruction ?&FE60, a reading of the user port.

Suppose we want to set bit 4 to a logic *one*. To set bits we must use the OR operation.

The mask now has to be worked out. With an OR operation a *one* in the mask will produce a *one* in the word, a *zero* in the mask will leave the word unchanged.

Note that this operation is carried out on each bit in the byte separately. So our mask for setting bit 4 is 00010000 or in hex &10. Thus the instruction:

```
?&FE60=?&FE60 OR &10
```

will turn on the device connected to bit 4. Similarly, to turn off bit 4 we must use a mask, but this time with the AND operator.

The rules for the mask for this logic operator say that a *zero* in the mask gives a *zero* in the word, and a *one* in the mask leaves the word unchanged. This makes the mask a little bit more difficult to work out.

What we want is a *zero* at bit 4 and logic *ones* everywhere else. This gives a mask of 11101111 (or in hex &EF) to turn off bit 4. Thus the instruction:

```
?&FE60=?&FE60 AND &FE
```

will turn off the device connected to bit 4.

Having seen that OR turns a device on and AND can be used to turn it off, then what does Exclusive OR do?

This allows you to reverse the state of a bit, which has the technical name "toggling".

The rules for the mask are that a *one* in the mask inverts the corresponding bit in the word, and a *zero* in the mask leaves the word unchanged. This type of operation is very useful for flashing lights, where all you want to do is to alter their current state.

Having a good grasp of the three logical operators will allow you easily to control any of the bits you want without affecting the others.

This technique can also be used when setting up the data direction register so as to initialise only the bit you want.

Try and work out a few examples yourself. Write the mask down on paper in terms of bits before converting them to a number.

Figure VI shows every different bit combination for word and mask for each logical operator. Remember the number can be a decimal one if you insist, but hex really is easier.

Since we are able to wire up any of our user port data bits to control the LEDs, we can use them in all sorts of applications.

For example, it can be a valuable form of indication when you do not want the screen disturbed. In this way the full screen can have a complex graphic display and user prompts can be indicated on the LEDs.

Instructions can also be embedded in programs when fault finding to indicate the program flow or the state of variables without disturbing the screen format. This is especially useful when

→

The OR operation

0	1	1	0	Word
0	0	1	1	Mask
0	1	1	1	Resulting word

The AND operation

0	1	1	0	Word
0	0	1	1	Mask
0	0	1	0	Resulting word

The Exclusive OR operation

0	1	1	0	Word
0	0	1	1	Mask
0	1	0	1	Resulting word

Figure VI: The bitwise combinations of logical operators

From Page 81

working with machine code.

It can also be useful if you want to animate the lights in a model.

There are other techniques for controlling devices that require more current (or "oomph", to use a technical expression). One way is to use a relay to control the larger current.

The only snag is that then you have to control the relay. This can be done with transistors, as it is inside the BBC Micro, but there is a better and more universal way of controlling a medium to high current device. This is by using the little-known VMOS power FET (Field Effect Transistor).

These devices are just the job for connecting to a micro as they need no extra components. Also they are not worried by back EMF (if you don't know about back EMF there is no need for you to be worried by it either).

This means they are ideal for switching inductive loads and some devices can switch up to 3 amps at 80 volts directly connected to the output of the user port.

There is really nothing to using them, either. Figure VII shows the general arrangement.

The only three connections to it are the gate – the controlling input – the source, which goes to the earth connection, and the drain, which is connected to the load.

The names of source and drain appear to be the wrong way round

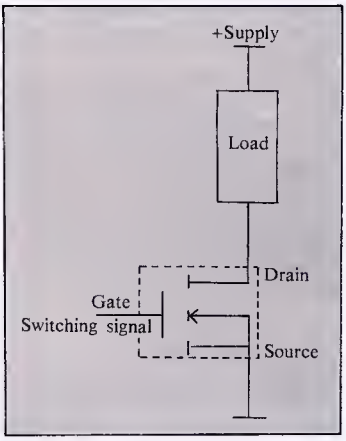


Figure VII: A VMOS FET

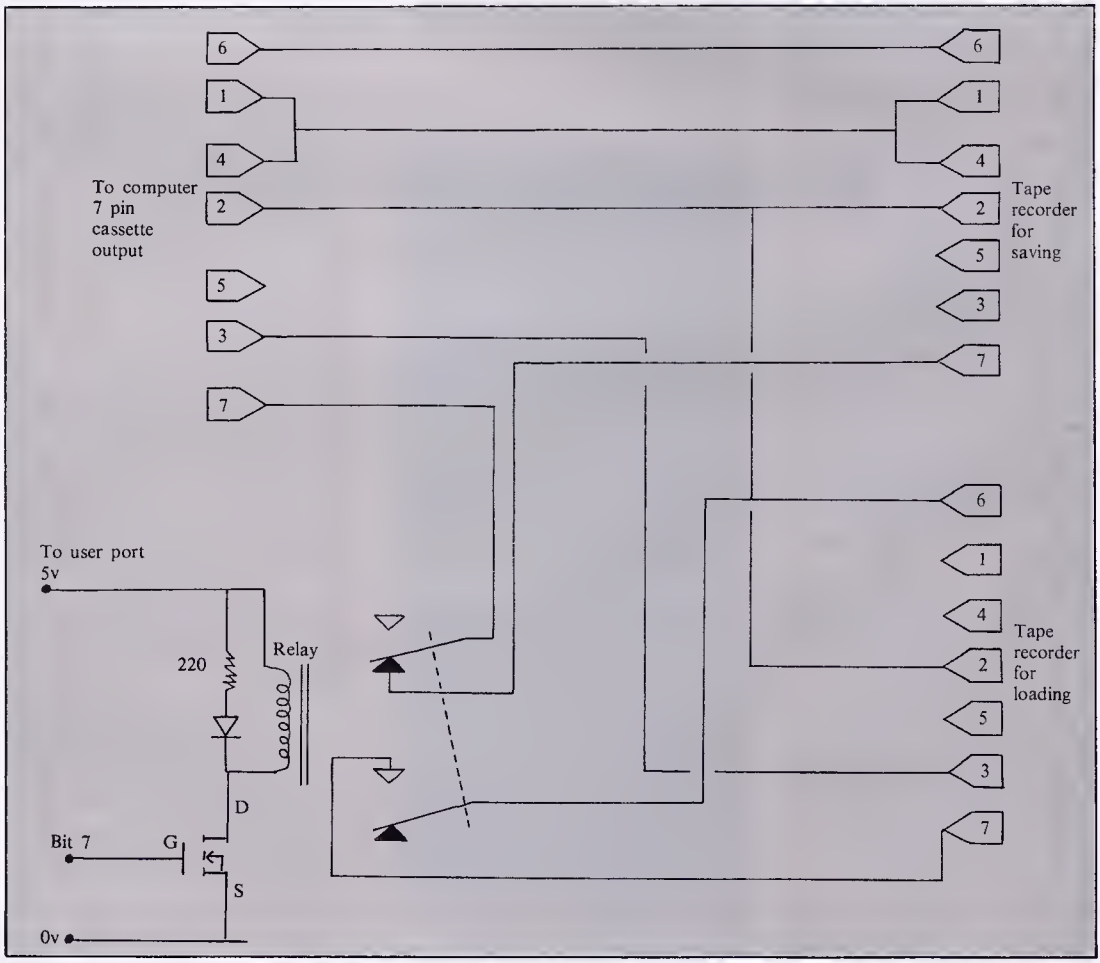
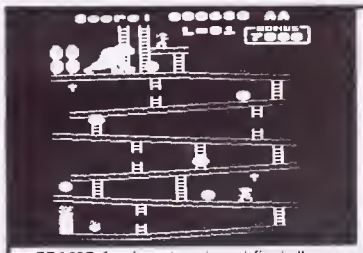


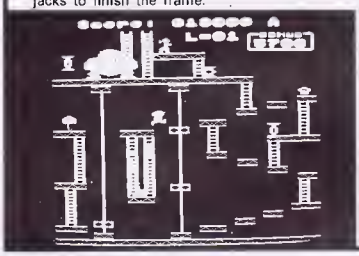
Figure VIII: Dual cassette system



FRAME 1 – Leap barrels and fire-balls or grab a hammer and smash them while climbing to the top.

You are Morris, a running barrel-jumping man, intent on rescuing the maiden from the clutches of the evil gorilla **KONG** who has her captive. As you climb the ladders and girders towards your goal you must negotiate the many hazards, and if possible try to collect the lady's possessions simultaneously. But each time you reach her **KONG** carries her off to a new location. Your only hope is to hack out the girders supporting **KONG** at the fourth location. Will you make it? Time is your enemy. It will require all your skill.
GOOD LUCK.

FRAME 3 – Jump on and off the lifts to cross the screen, passing the bouncing jacks to finish the frame.



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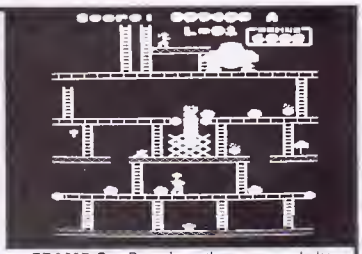

FRAME 2 – Run along the conveyor belts avoiding the pies and **KONG** himself. Mind the moving ladders.

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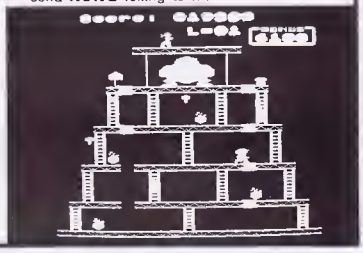
FRAME 4 – Remove the eight bridges by crossing them, and smash the fire-balls, to send **KONG** falling to his death.



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From Page 82

because the solid state physicists who dream up these devices describe everything in terms of electron flow.

Electrons flow from negative to positive. Mere mortals use the conventional current flow, which is from positive to negative (obvious, but as usual, wrong).

The other end of the load is connected to the supply, and on these devices can be up to 80 volts and still be switched by the 5 volt output of the user port.

As the dual cassette system uses some components you might not readily be able to get hold of, we have produced a kit of parts. The kit, known as Body Build Pack 3, consists of:

1 Two-pole change-over 5 volt relay.
1 VN10KM power VMOS FET.
1 Green LED and limiting resistor.
3 PCB-mounting 7-pin DIN sockets.
2 7-pin DIN plugs with 1ft of 6 core cable.
1 Small piece of perforated copper strip board.

● **It is available from The Micro User for £9.95, including p&p and VAT. There is an order form on Page 87.**

The V in VMOS comes from the way they are constructed internally with a V groove forming the channel for the current to flow down each wall.

With one of these devices and a relay we can add a second cassette recorder to the BBC Micro. This allows you to have one recorder for saving and one for loading.

In addition, if you have a program that handles data you will not be restricted to using files that can be wholly contained in the computer at any one time.

As you have two recorders you can load in a portion of your file, modify it (or not) and then write it out to the second recorder before loading the next part in.

This is a technique that you can normally only use with disc files. It means the size of the data base you can handle is only limited by the playing time of the tape (and your patience).

On page 433 of your hymn book (the User Guide) it states that you can "easily implement a dual cassette system" and goes on to tell you how.

It also states that the internal motor control relay can be used for one type of operation with your own relay controlling the other.

Being a simple and trusting soul I tried the suggested method, only to find that whatever I did the internal relay kept coming on.

A phone call to Acorn assured me that there was no fault with either the operating system or the manual, the implication being that I was doing something wrong.

After much beating my head against the computer and many more phone calls insisting something was wrong I got to speak to someone really technical.

He listened to my problem and said he would ring me back in 20 minutes when he had tried what I suggested.

My call was returned in less than that time and I was greeted by a voice saying "Yes, you are completely right!"

Apparently some problems with the serial ULA had resulted in a patch being put into the operating system (1.2 no less) that turns the cassette relay on and off very rapidly just before a LOAD and SAVE but after the OSBYTE call has been made. This is the electrical equivalent of giving it a thump!

This cured the problem, but left the cassette relay on, exactly as I had found.

In another priceless quote from Acorn I was told that the person who wrote that part of the User Guide "did not fully ascertain what we meant", which neatly avoided admitting to an error.

I was told that I would have to use two relays to implement this as they did when they tested it "in house".

Well if there's a chance to go one better than Acorn I'm not one to pass it up, so I designed a dual cassette system that uses only one relay.

The circuit is shown in Figure VIII. It uses a double-pole change-over relay – that is, two sets of relay contacts that move at the same time.

The internal relay is wired through the normally closed contacts of one of the poles before going to one recorder. This means that the recorder is switched on only if the internal relay is on AND the external relay is off.

The other recorder is wired up conventionally to the normally open contacts. An LED is added to indicate when the external relay is activated.

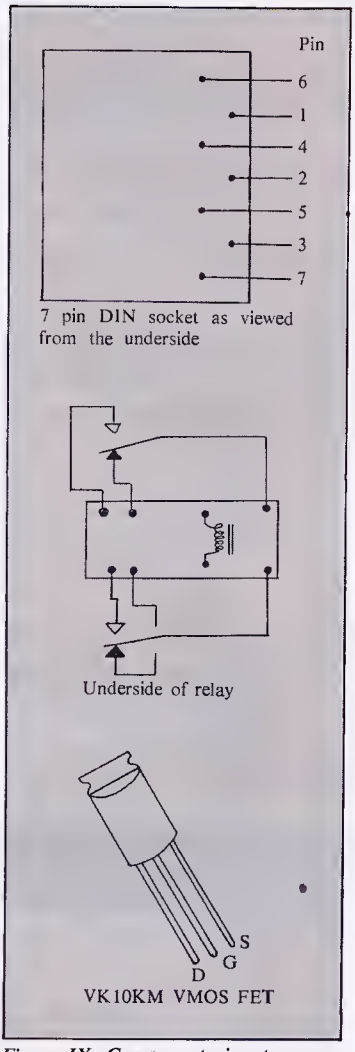

Figure IX: Component pinout

I do not believe in giving practical circuit layouts. The reason being it introduces too many errors, not only in their production but also by people trying to follow them.

With a theoretical circuit you can follow the flow of the signal or whatever and can wire it up in an orderly fashion.

However, with a practical layout it is very easy to miss something and, as you well know, no amount of looking will make you see it again.

It is really not very hard to acquire the skill of looking at a circuit diagram and connecting the wires up to the right place. Also fault finding is so much easier as you know where every com-

→

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From Page 85

ponent is and what it does. All in all it is good for your soul.

The main problem people have when working with perforated copper strip board is when it comes to breaking the tracks. A lot of people simply do not! It is surprising how a fine wafer of copper may be still be connecting the track.

A way to avoid this is to scratch the place where the track is supposed to be broken with a screwdriver.

Also see Figure IX for the relationship between the components' leads and their functions. This is known technically as the "pin out" of a device.

Having produced the hardware, a software patch is needed to intercept the OSBYTE routine and control the extra cassette relay.

The machine code program sits at the bottom of the free space in page &D. This is to allow you to run other programs, such as screen dumps, which always seem to start at &D00.

Also if you have discs (which use this space) you would hardly be wanting a dual cassette system, would you?

It can however be relocated. I have used bit 7 to control the relay but you can change that if you want by changing the masks in lines 50, 60, 210 and 240.

The program initialises the VIA and then loads the patch into memory. Next it moves the OSBYTE vector in &20B and &20B into a space at the end of the program, and then puts a new vector into this location to direct all OSBYTE calls into the patch.

Finally, it reprograms the break key to re-install the patch.

All you need to do is run the program and then forget about it. The LOAD and SAVE commands will then be redirected to use separate recorders.

NEXT MONTH we shall look at how to control something that needs a lot more oomph and allows you to extend your controlling influence.

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```
  10 PRINT "DUAL CASSETTE PATCH"
  20 PRINT "BEEB BODY BUILDING C
OURSE"
  30 PRINT "AUGUST 1983"
  40 PRINT "BY MIKE CODK"
  50 ?&FE62=?&FE62 OR &80
  60 ?&FE60=?&FE60 AND &7F
  70 FOR A=0 TO 2 STEP 2
  80 P%=&0DA
  90 [
 100  OPT A
 110  .PTCH
 120 CMP #137
 130 BNE USND
 140 TYA
 150 CMP #0
 160 BEQ AWRITE
 170 TXA
 180 CMP #0
 190 BEQ DONE2
 200 LDA &FE60
 210 ORA #&80
 220 JMP SKIP
 230 .DONE2 LDA &FE60
 240 AND #&7F
 250 .SKIP STA &FE60
 260 RTS
 270 .AWRITE LDA#137
 280 .USND JMP (VECT)
 290 .VECT NOP:NOP
 300 ]
 310 NEXT
 320 ?VECT=?20A
 330 ?(VECT+1)=?&20B
 340 ?&20A=PTCH MOD 256
 350 ?&20B=PTCH DIV 256
 360 PRINT"PATCH NOW INSTALLED"
 370 *KEY 10 ?&FE62=&80:?FE60=0:
?&20A=&DA:?&20B=&D !M
```


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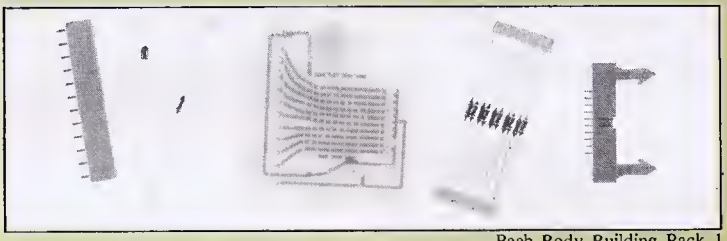

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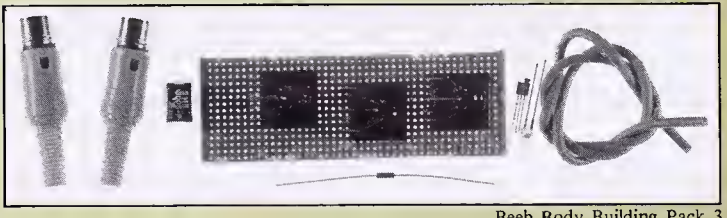

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Part six of MIKE BIBBY'S introduction to programming

LAST month we looked at creating a loop using the idea of REPEAT... UNTIL.

REPEAT marks the beginning of the loop, UNTIL marks the end. The lines of code to be repeated, that is, those lines between REPEAT and UNTIL, are termed the body of the loop.

Directly following UNTIL, on the same line, is the loop's condition. This is the test by which the micro decides whether to finish the loop or not.

Program I uses this technique to print out the numbers 1 to 24.

```
10 REM PROGRAM I
20 MODE 6
30 number = 0
40 REPEAT
50 number = number + 1
60 PRINT number
70 UNTIL number = 20
80 PRINT "We have finished the
   loop."
```

Progam I

Here the loop's finishing condition is that number=24. Note that the effect of line 50 is to take the value stored in the variable number, add one to it, then store it back in the variable number.

(Remember, the computer does what is on the right of the equals sign then stores it in the variable on the left.)

The body of the loop, lines 50 and 60, is repeated until the condition is met – that is, UNTIL number=20. Once this is so, the program continues in order of the line numbers, carrying out line 80 next. When we finish a loop and go on to the subsequent line we say we have "dropped through the bottom of the loop."

You might recall from last month that if we were to make line 70:

70 UNTIL FALSE

the loop would repeat indefinitely. This is because the program hasn't given the micro anything to be FALSE, so it keeps repeating.

You see, the BBC Micro is very sweet natured – it believes everything is TRUE until it is told otherwise!

Try making line 70:

70 UNTIL TRUE

and your loop will "disappear". To our ingenuous micro, all is gospel!

Have a look at Program II. This is

```
10 REM PROGRAM II
20 MODE 6
30 total=0
40 REPEAT
50 INPUT "A NUMBER",number
60 total=total+number
70 UNTIL number=0
80 PRINT"The total was ";total
```

Program II

slightly more complex than ones we have met so far, so let's discuss it in detail.

The program simply adds up a series of numbers that you input then prints out the total. With a program like this it's useful to have a "key" to stop the program when you've had enough. That is, you input some special number such as –999 to signal that you've finished.

In this program the key is 0, since you wouldn't want to use the program to add 0 to anything.

Line 70 tells the micro to keep on repeating the loop UNTIL the last number input is 0.

Notice how line 60 adds up the total. It's a bit like our previous lines such as

number=number+1

Let's go through it, adding a couple of numbers:

Initially total is zero. Then line 50 inputs a number. Let's say it's 2. Line 60 adds this to the total, which is at this point zero, and stores the result (2=2+0) in the variable total. So now the total is 2, which is correct since we have only input one number, 2.

The loop then repeats, since the last number input wasn't zero, and you're prompted for another number. Let's assume we chose 6 this time, so number has the value 6. Line 60 adds this to the previous total (2) then stores the result (8=6+2) back in total.

If we then went on to input a 4, line 60 would add this to the current total (8) and store it back in total (12=8+4=6+2+4) which now contains the sum of all the inputs.

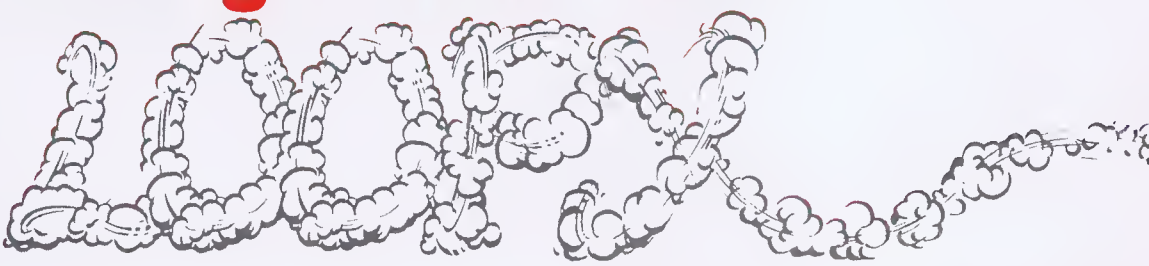
I think you can now appreciate that, as we continue with this, total would continue to contain the total of the figures since line 60 updates total at each input.

When we wish to put a halt to the proceedings we simply input 0. Although line 60 will add this to the total, adding zero makes no difference to it. However, when we meet line 70 the condition is now met as number = 0 and the loop finishes. We drop out of the bottom of the loop and proceed to line 80, which then prints the total.

To change subject slightly, do you remember from your schooldays the symbols > and < ? The first means greater than and the second means less than.

For example, 6 > 3 means 6 is greater than 3, which is true. 5 < 3

Let's go even more



means 5 is less than 3, which is a downright lie!

These symbols are known as inequalities.

(If you're anything like me, you'll get confused between > and <. The trick is to remember that, for both symbols, the largest number goes opposite the bigger end of the symbol, whereas the smaller number goes opposite the sharp, or smaller, end. It may not be the way Einstein remembered it, but it works well enough for me!)

Look at Program III. This simply

```
10 REM PROGRAM III
20 MODE 6
30 number=0
40 REPEAT
50 PRINT number
60 number=number + 2
70 UNTIL number = 10
```

Program III

prints out numbers in ascending steps of 2 from 0 to 8.

Notice that it never actually prints out 10. To see why, suppose number has reached 8 and that its value has been printed out by line 50. Line 60 then adds 2 to number to make it 10. This "trips" the loop condition of line 70, which means that the loop isn't repeated so that number is not printed out when its value is 10.

Alter line 70 in Program III so that it reads:

70 UNTIL number > 10

Now the final condition for the loop is that the value of number must be greater than 10. If you run the altered program you'll find that 10 is printed out this time.

To see why, suppose that number has reached 8 and line 50 has printed it. Line 60 then increases the value of number to 10. Line 70 checks to see if number is greater than 10.

Of course number isn't greater than ten, it's exactly 10, so the loop is repeated and line 50 prints out 10.

Then, of course, 2 is added to number by line 60 making it 12. This then "fails" the test on line 70 since 12 is greater than 10.

Try changing line 60:

60 number = number + 0.5

Before you run it, see if you can predict the final number to be printed!

Program IV demonstrates the use of the less than sign, <. Hopefully, it should be fairly clear. Can you alter the program so that it prints out all the

```
10 REM PROGRAM IV
20 MODE 6
30 number=10
40 REPEAT
50 PRINT number
60 number=number - 1
70 UNTIL number < 5
```

Program IV

numbers from 10 to 1? How about from 100 to 0?

What happens if we change line 80 to:

80 UNTIL number>5

We can combine the <, >, and = signs, for example:

REPEAT

.

.

.

UNTIL test> = 6

means repeat the loop until the variable test is greater than or equal to 6.

Similarly, =< means less than or equal to.

Less obviously, <> means not equal to.

By now we are used to the idea of testing for conditions at the end of a REPEAT ... UNTIL loop. Let's have a look at another method of testing for conditions – the idea of IF ... THEN.

Here we tell the computer IF such and such is true THEN do something. For example, in Program V we use the IF ... THEN test three times to sort

```
10 REM PROGRAM V
20 MODE 6
30 REPEAT
40 INPUT "A Number",number
50 IF number > 10 THEN PRINT
number" is greater than 10."
60 IF number = 10 THEN PRINT
number" is equal to 10."
70 IF number < 10 THEN PRINT
number" is less than 10."
80 UNTIL FALSE
```

Program V

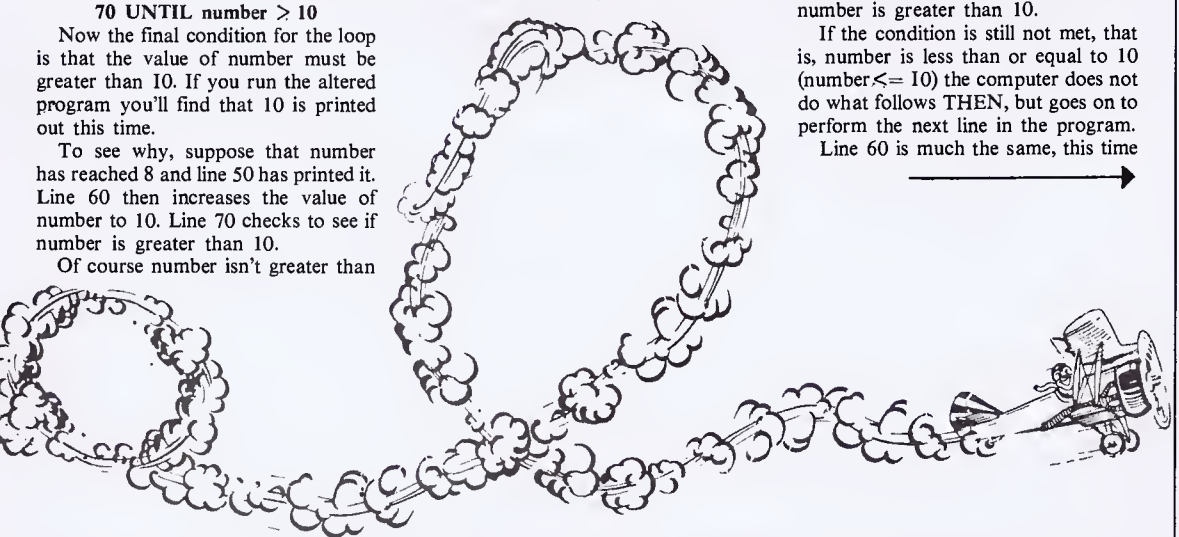
the number we input into three categories – greater than ten, equal to ten and less than ten, printing out the appropriate message.

In line 50 the computer tests to see if number is greater than 10. IF this is true (that is the condition is met) THEN the computer does something – in this case printing out that the number is greater than 10.

If the condition is still not met, that is, number is less than or equal to 10 (number <= 10) the computer does not do what follows THEN, but goes on to perform the next line in the program.

Line 60 is much the same, this time

→



From Page 89

printing its message only if number is equal to 10.

Line 70 then checks to see if number is less than 10, and prints out the appropriate message.

The whole thing is tied up in a REPEAT ... UNTIL loop so you can keep on testing to make sure that the IF ... THEN statement really does work.

You don't have to follow THEN with a PRINT statement – you can follow it with a GOTO, as Program VI makes clear.

This rather silly program just keeps on prompting for a string. If you input anything other than YES, the program loops back and prompts for a string again. This is not the best of programs, but it does illustrate two points:

- The use of the symbol<> meaning not equal to. Notice we're using it with a string – it's not limited to numbers.
- Although we've used GOTO to create a loop, unlike our previous loop with GOTO this is a conditional loop. If string$ isn't YES the micro does what follows THEN: it goes to 30, since the condition after IF is true.

If string$ is YES, the condition has not been met so the micro does not do what is after THEN. That is, it doesn't go back to 30, but drops through to line 50.

Program VII should be quite easy to understand – it uses a REPEAT ... UNTIL loop to print out the numbers 1 to 6.

Program VIII performs exactly the same operation using a conditional GOTO, and<=, which means less than or equal to.

Which of the two programs do you think is easier to follow?

I think that most would agree that it's far easier to understand the REPEAT ... UNTIL loop.

The use of GOTO nearly always makes a program harder to read, and for a variety of reasons its use is to be discouraged.

NEXT MONTH we shall be looking at the FOR . . . NEXT loop, and will really start putting our micro to work.

```
10 REM PROGRAM VI
20 MODE 6
30 INPUT"Do you want to finish",
string$
40 IF string$<>"YES"  THEN GOTO
30
50 PRINT "Alright,we'll stop."
```

Program VI

```
10 REM PROGRAM VII
20 MODE 6
30 number=1
40 REPEAT
50 PRINT number
60 number=number+1
70 UNTIL number>6
```

Program VII

```
10 REM PROGRAM VIII
20 MODE 6
30 number=1
40 PRINT number
50 number=number+1
60 IF number <= 6 THEN GOTO 40
```

Program VIII

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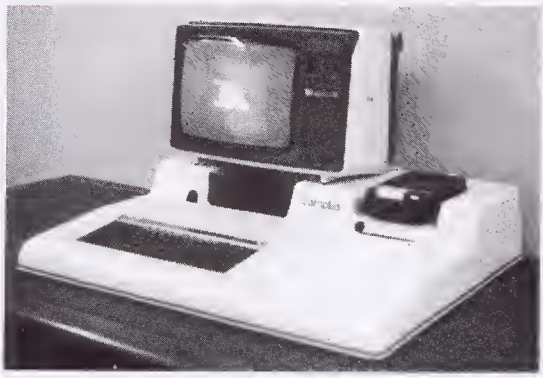
Fruities listing

From Page 60

```
  10 PRDCinit
  20 ONERRDRPROCerror
  30 REPEAT
  40 *FXI2,0
  50 *FX15,1
  60 *FX4,1
  70 REPEAT:MODE7:PROCheader:PROCtitIes
  80 TIME=0:A%=0:REPEATA%=INKEY(1):UNTILA%=89DRA%=78ORTIME>3000
  90 IFA%=89PRDCinstruct:ELSEIFTIME>3000:MDDE2:PROCscores
 100 UNTILA%=78
 I10 MODE2:VDU23;8202;0;0;0;19,4,1;0;
 I20 PROCscreen:PROCmove(0)
 130 *FXI1,1
 140 *FXI2,1
 I50 REPEAT
 I60 PRDCmanmove
 I70 IFPDINT(X%+32,Y%-24)=S%PRDCdead
 I80 *FXI5,1
 190 PROCaliens(Y%)
 200 IFPDINT(X%+32,Y%-24)=S%PRDCdead
 210 IFNO%=0PROCsheet
 220 PRDCoxygen
 230 UNTILMAN%<=0
 240 UNTIL FALSE
 250 END
 270 DEFPROCmanmove
 280 K%=INKEY(0):IFK%=-IENDPROC
 290 IFK%=32PROCdig:ENDPRDC
 300 IFK%=47X%=X%+64:NCAR%=7
 310 IFK%=46X%=X%-64:NCAR%=8
 320 IFX%)1216X%=12I6ELSEIFX%<0THENX%=0
 330 K%=K%AND&DF
 340 1FK%=65ANDPDINT(X%+32,Y%+6)=R%Y%=Y%+32:NCAR%=12:PROCmove(I):ENDPRDC:ELSEIFK%=65ENDPRDC
 350 IFK%=90ANDPOINT(X%+32,Y%-42)=R%Y%=Y%-32:NCAR%=12:PRDCmove(1):ENDPRDC:ELSEIFK%=90ENDPRDC
 360 PROCmove(I):1FPDINT(X%+36,Y%-58)=S%Y%=Y%-32:PROCmove(0):PRDCdead:ENDPRDC
 370 1FPOINT(X%+36,Y%-58)=0PROCfall
 380 ENDPROC
 400 DEFPRDCmove(L%):VDU5:GCOL3,3:MOVEDLDX%,OLDY%:VDU227+0CAR%:MDVEX%,Y%:VDU227+NCAR%:SOUND&10,-10,6,L%:OLDX%=X%:OLDY%=Y%:OCAR%=NCAR%:VDU4:ENDPRDC
 4I0
 420 DEFPROCdig:1FNCAR%=7PROCdig_right:ELSEIFNCAR%=8PROCdig_left
 430 ENDPRDC
 440
 450 DEFPRDCdig_right:1FPDINT(X%+65,Y%-I2)=R%DRPDINT(X%,Y%-40)=I00RPOINT(X%+160,Y%-36)=00RPDINT(X%+96,Y%-60)=00RPOINT(X%+96,Y%)=-IENDPROC
 460 A%=PDINT(X%+92,Y%-38):8%=POINT(X%+92,Y%-56):NCAR%=9:PROCmove(0):SOUND&10,-15,4,1:GCDL0,8:VDU5;I0;9;127
 470 IF8%=S%PROCkiIl_right
 480 IFA%=0AND8%=0VDU238:SOUND0,15,6,1
 490 IFA%=0AND8%=8VDU231
 500 IFA%=8AND8%=8VDU230
 510 NCAR%=7:PROCmove(0):ENDPRDC
 520
 530 DEFPRDCdig_left:IFPDINT(X%-1,Y%-12)=R%DRPDINT(X%,Y%-40)=10DRPOINT(X%-96,Y%-36)=00RPOINT(X%-32,Y%-60)=00RPOINT(X%-10,Y%)=-1ENDPROC
 540 A%=PDINT(X%-48,Y%-38):B%=PDINT(X%-36,Y%-56):NCAR%=10:PRDCmove(0):SDUND&0010,-15,4,1:GCOL0,8:VDU5;I0;8;127
 550 IF8%=S%PROCkiIl_left
 560 IFA%=0AND8%=0VDU238:SOUND0,-I5,6,1
 570 IFA%=0AND8%=8VDU231
 580 IFA%=8AND8%=8VDU230
 590 NCAR%=8:PROCmove(0):ENDPROC
 600
 610 DEFPRDCfaIl:NCAR%=12:SDUND&12,3,230,I:REPEAT:Y%=Y%-16:PRDCmove(0):UNTILPOINT(X%+30,Y%-58)=80RPOINT(X%+30,Y%-33)=100RPOINT(X%+32,Y%-42)=R%ORPOINT(X%+36,Y%-58)=S%
 620 IFPOINT(X%+36,Y%-58)=S%SDUND&00I3,0,0,1:Y%=Y%-32:PROCmove(0):PRDCdead:ENDPRDC
 630 SDUND&12,0,0,1:SOUND0,-15,4,1:NCAR%=13:PRDCmove(0):ENDPRDC
 640 DEFPROCoxygen:D%=O%-2:PRINTTA8(7,31);O%;"  ";:IFD%<=0PROCdead
 650 ENDPRDC
 660
 670 DEFPROCdead:NCAR%=I2:SOUND&12,2,I70,60:FORN=1TO20:Y%=Y%+32:PROCmove(0):Y%=Y%-32:PROCmove(0):SOUND&I1,4,N*12,60:SOUND&I0,2,7,60:NEXT:VDU5;127;232;4:FDRN=1TO3000:NEXT:MAN%=MAN%-1:IFMAN%<=0PROCend:ENDPROC:ELSEQ%=Q%-1:PRDCsheet
 680 ENDPRDC
 690
 700 DEFPROCend:VDU4:COLOURI28:CDLOUR6:PRINTTAB(7,14);"THE END";:FDRN%=1TO60:VDU19,8,RND(7);0;:FORn=ITO70:NEXT:SOUND&I1,4,RND(N),60:NEXT:VDUI9,8,2;0;:PRINTTA8(7,14);:FDRN=1TD7:COLOURN:VDU227:SDUND&I0,2,6,60:FORT=ITO599:NEXT:NEXT:TIME=0
 710 REPEATUNTILTIME>I00:IFHI%<SC%THENHI%=SC%
 720 ENDPROC
 730
 740 DEFPROCaliens(Z%):LOCALX%,Y%:N%=N%+1:IFN%>Q%N%=1
 750 IFS%(N%)=0ENDPRDC
 760 X%=AX%(N%):Y%=AY%(N%):V%=MX%(N%):W%=MY%(N%):A%=POINT(X%+2,Y%+6):8%=POINT(X%+2,Y%-42):C%=POINT(X%+30,Y%-48):D%=POINT(X%+36,Y%-58)
 770 IFW%>0ANDAX=R%Y%=Y%+W%
 780 IFW%<0AND8%=R%Y%=Y%+W%
 790 IFC%=0ANDD%=8PROCfiIl:ENDPR8C
 800 IFC%=0ANDD%=0PRDCdrop:ENDPROC
 810 IFY%=92DRY%=252DRY%=412ORY%=5720RY%=732DRY%=892PRDCIeveI
 820 AX%(N%)=X%:AY%(N%)=Y%:MX%(N%)=V%:MY%(N%)=W%:PRDCamove:ENDPROC
 830
 840 DEFPRDCIeveI:X%=X%+V%:IFX%<0V%=64:X%=64ELSEIFX%)1216V%=-64:X%=12I6
 850 IFZ%<Y%W%=-32
 860 IFZ%>Y%W%=32
 870 IFY%=Z%W%=(2-RND(3))*32
 880 ENDPROC
 890
 900 DEFPRDCfiIl:AY%(N%)=AY%(N%)-16:PRDCamove:SOUND0,-15,2,3:AY%(N%)=AY%(N%)+I6:PROCamove:GCOL0,8:VDU5;8;10;228;4:ENDPROC
 910
 920 DEFPROCdrop:AY%(N%)=AY%(N%)+16:PROCamove:AY%(N%)=AY%(N%)-16:PROCamove:SOUND&13,4,50,60:L%(N%)=L%(N%)+1:IFL%(N%)=20THENIFPDINT(X%-2,Y%-6)=80RPDINT(X%+74,Y%-6)=8PROCcrawI_out:ENDPROC
 930 IFPDINT(X%-2,Y%-6)=80RPDINT(X%+74,Y%-6)=8ENDPROC
 940 SDUND&11,0,I30,I:SOUND&10,-15,7,6:AY%(N%)=AY%(N%)-32:PRDCamove:ENDPROC
 950
 960 DEFPRDCcrawI_out:AY%(N%)=AY%(N%)+32:PRDCamove:FDRU%=100TO250STEP10:SDUND&1I,0,U%,I:SOUND&10,-15,7,1:NEXT:GCDL0,8:VDU5;8;10;228;4:L%(N%)=0:ENDPRDC
 970 DEFPRDCkiII_right:LDCALN%:FDRN%=1TO3:IFX%+64=AX%(N%)ANDY%-32=AY%(N%)PRDCafaII
 980 NEXT:ENDPRDC
 990
I000 DEFPRDCkiII_Ieft:LDCALN%:FORN%=1TO3:IFX%-64=AX%(N%)ANDY%-32=AY%(N%)PROCafaII
I010 NEXT:ENDPRDC
I030 DEFPROCamove:VDU5:GCDL3,S%:MDVEDLDAX%(N%),DLDAY%(N%):VDU227:MDVEAX%(N%),AY%(N%):VDU227;4:DLDAX%(N%)=AX%(N%):OLDAY%(N%)=AY%(N%):ENDPRDC
I050 DEFPROCafaII:LOCALX%,Y%:VDU5;9;127;228:I%=100:GCOL3,S%:VDU8;227:SOUND&I1,3,255,60:SOUND&I0,-I5,7,60
```

→

B.B.C. DESKTOP CONSOLE



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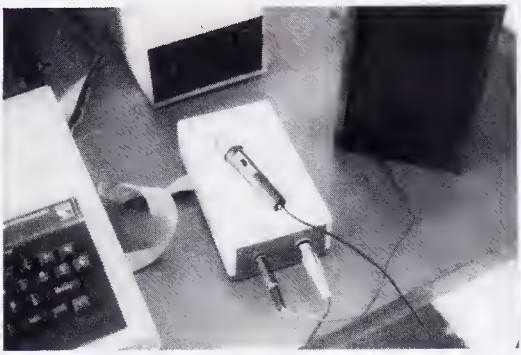

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Fruities listing

From Page 93

```
1060 REPEAT:AY%(N%)=AY%(N%)-32:X%=AX%
(N%):Y%=AY%(N%):IFPOINT(X%-2,Y%)=80RPD
INT(X%+74,Y%)=86COL0,8:VDU5;8;10;22B:I
%=I%+100
1070 PROCamove:UNTILPOINT(X%+30,Y%-58
)=BDRPOINT(X%+30,Y%-33)=100RPOINT(X%+3
2,Y%-42)=R%:IFPOINT(X%+32,Y%-42)=R%AY%
(N%)=AY%(N%)-32:AX%(N%)=AX%(N%)+64:PRO
Camove
1080 FORN=1TO5:SOUND&11,0,0,1:NEXT:IF
I%)=F%PRDCsplat:ELSESOUND&11,1,100,200
:SOUND&10,2,7,200
1090 VDU4:ENDPRDC
1110 DEFPRDCsplat:S%(N%)=0:SDUND&11,1
,200,90:SDUND&10,2,7,60:VDU5;127;:GCDL
3,S%:PRINT;I%;:FORT=1TO500:NEXT:VDU8;8
;8;:PRINT;I%;:VDU4:SC%=SC%+I%:PRINTTAB
(5,1)"SCDRE:";SC%;:I%=0:L%(N%)=0:NO%=N
D%-1:ENDPRDC
1130 DEFPROCinit:DIMSET(6),MX%(3),MY%
(3),LV%(3),AX%(3),AY%(3),OLDAX%(3),OLD
AY%(3),L%(3),R%(3),S%(3):HI%=1000
1140 ENVELDPE1,1,1,-3,1,20,20,20,0,0,
0,0,0:ENVELDPE2,130,0,0,0,0,0,0,127,
-1,0,0,126,0:ENVELOPE3,128,-1,0,0,200,
0,0,127,0,0,0,126,0:ENVELOPE4,1,3,-2,3
,10,10,10,127,-1,0,0,126,0
1150 VDU23,227,66,36,36,126,219,255,2
55,126
1160 VOU23,228,123,123,123,0,222,222,
222,222
1170 VDU23,229,129,129,129,255,129,12
9,129,255
1180 VDU23,230,0,1,67,0,206,222,222,2
22
1190 VDU23,231,0,0,0,0,128,194,198,22
2
1200 VDU23,232,16,16,124,16,16,56,126
,255
1210 VDU23,234,96,108,72,120,64,64,64
,96
1220 VOU23,235,6,54,18,30,2,2,2,6
1230 VDU23,236,96,96,64,96,80,76,66,9
6
1240 VOU23,237,6,6,2,6,10,50,34,6
1250 VDU23,238,0,0,0,0,0,0,0,0
1260 VDU23,239,66,90,74,126,24,60,36,
36
1270 VOU23,240,66,90,74,126,24,60,36,
36
1280 ENDPROC
1300 OEFPROCscreen:COLOUR138:VDU19,5,
0;0;28,0,2,19,1:CLS:VDU28,0,31,19,30:C
LS:MAN%=3:R%=5:VDU26:SC%=0:PRINTTAB(5,
1);"SCORE:";:Q%=0:F%=100:S%=4:ND%=0:H%
=0:VDU19,8,2;0;19,9,3;0;19,10,6;0;:PRD
Csheet:ENDPROC
1320 DEFPRDCsheet:PRINTTAB(0,1);STRIN
G$(MAN%,CHR$(234));"  ";:Q%=Q%+1:IFQ%)
3THENQ%=1:F%=F%+100:IFF%)500F%=500
1330 H%=F%DIV100:IFH%=4H%=5ELSEIFH%)=
5H%=6
1340 R%=H%EOR4:VDU19,S%,H%;0;:NO%=Q%:
FORN=1TOQ%:S%(N)=1:NEXT
1350 VDU19,R%,0;0;:COLOUR128:COLOUR8:
VDU24,0;64;1279;895;:CL6:VDU26:PROCbri
cks:VDU19,R%,5;0;:COLOUR138:COLOUR0:O%
=2000:PRINTTAB(0,31);"OXYGEN ";D%;:PRD
CIadders
1360 X%=256:Y%=252:OLDX%=X%:OLDY%=Y%:
NCAR%=7:DCAR%=11:DX%=2000:PROCmove(0):
PRDCpositions:COLDUR138:CDLDUR7:ENDPRO
C
1380 DEFPROCpositions:AX%(1)=256:AX%(
2)=320:AX%(3)=64:FDRN=1TD3:AY%(N)=732:
OLDAX%(N)=0:OLDAY%(N)=0:LV%(N)=1:NEXT:
MX%(1)=64:MX%(2)=-64:MX%(3)=-64:MY%(1)
=32:MY%(2)=-32:MY%(3)=32:N%=0:ENDPRDC
1400 DEFPROCbricks:8R$=STRING$(20,CHR
$(228)):FORN=5TO25STEP5:PRINTTAB(0,N)B
R$:NEXT:ENDPROC
1420 DEFPRDCIadders:VDU19,R%,0;0;:COL
OURR%:COLOUR128:FORLV=4TO24STEP5:REPEA
T:SET(0)=0:FORN=1TO5:SET(N)=RND(TIME)A
ND1:SET(0)=SET(0)+SET(N):NEXT:IFLV<)24
THENNo=3ELSENo=2
1430 UNTILSET(0)=No:Z=0:FORPUS=2TO18S
TEP4:Z=Z+1:IFPUS=18PUS=17
1440 IFSET(Z)=1PROCIadd
1450 NEXTPUS,LV:VDU19,R%,5;0;:ENDPROC
1460
1470 DEFPRDCIadd:LD=0:PRINTTAB(PUS,LV
)"";:REPEAT:VDU229;10;8:LD=LD+1:UNTILL
D=6:ENDPRDC
1490 OEFPROCinstruct:PROCheader
1500 PRINT''"Once upon a time there w
as a garden..."'"And in this garden gr
ew a patch of wild and mysterious frui
t."'"So strange was this fruit that ma
ny"'"craved for a taste.However when a
nyone  came near to it, it would get u
p and"
1510 PRINT"devour them!!"'"Are you a
brave enough soul to travel  into the
";CHR$(130);"88C FRUITY-PATCH ??"'"If
so then follow me"
1520 PRINT''"PRESS SPACE TO CONTINUE"
1530 REPEATUNTILINKEY(1)=32
1540 PROCheader
1550 PRINT''"Using your skill and cun
ning you must  outrun the little begg
ars."'"You start each sheet with a new
 network of";CHR$(133);"ladders";CHR$(
135);"and";CHR$(130);"paths";CHR$(135)
;",and as your skill"
1560 PRINT"increases you will eventua
lly meet the"
1570 PRINT'CHR$(129);CHR$(136);"
ULTIMATE little horror"'
1580 PRINT"that can only be killed by
being droppedthrough";CHR$(131);"FIVE
WHOLE LEVELS"
1590 PRINT''"PRESS SPACE TO CONTINUE"
1600 REPEATUNTILINKEY(1)=32
1610 PROCheader
1620 PRINT'"Just before I go, here ar
e a few clues.":PRINTCHR$(129);"BEWARE
";CHR$(135);"DON'T STAY in the same pl
ace"'"too long."'"Dig holes fast and d
eep and hit the"'"beasts before they g
et time to crawl"'"out."
1630 PRINT"Oh and by the way watch yo
ur";CHR$(134);CHR$(136);"OXYGEN";CHR$(
135);CHR$(137);"ifit runs out you lose
 a life."
1640 PRINT''CHR$(136);CHR$(130);"
      GOOD LUCK"''"PRESS SPACE TO CON
TINUE"
1650 REPEATUNTILINKEY(1)=32
1660 PROCheader:PRDCtitles
1670 ENDPROC
1690 DEFPROCheader
1700 CLS:VDU23;8202;0;0;0;
1710 PRINTTAB(0,4);:VDU141;132;157;13
0:PRINTTAB(12,4)"WILD  ";:VDU136:PRINT
"FRUITIES"
1720 PRINTTAB(0,5);:VDU141;130;157;13
1:PRINTTAB(12,5)"WILD  ";:VDU136:PRINT
"FRUITIES"
1730 PRINTTAB(12,8);CHR$(141);"HI:";C
HR$(136);HI%;:PRINTTAB(12,9);CHR$(141)
;"HI:";CHR$(136);HI%;
1740 ENDPROC
1760 DEFPRDCtitles
1770 PRINTTAB(11,6);:VDU128+RND(8):PR
INT"By Mark Smiddy"
1780 PRINTTAB(12,11)"A  =  UP";TAB(
12,13)"Z  =  DOWN";TAB(12,15")  =
  LEFT";TAB(12,17)"?  =  RIGHT";TAB(
11,19)"SPC  = ";CHR$(136);CHR$(130);"D
16"
1790 PRINTTAB(5,22)"NEED INSTRUCTIONS
(Y/N)";CHR$(137)
1800 ENDPROC
1820 DEFPROCscores:VDU23;8202;0;0;0;:
PROCscreen:LOCALN%,N:COLOUR128
1830 FORN%=5TO25STEP5:N=N+1:IFN=4N=5
1840 S%(1)=1:*FX15,1
1850 COLOURN:PRINTTAB(3,N%-1);CHR$(22
7);TAB(7,N%-1);N%OIV5*100;:NEXT:TIME=0
:Q%=1:REPEATPROCaliens(RND(64)*25):UNT
ILTIME>3000ORINKEY$(0)<>"":VDU4:ENDPRO
C
1870 DEFPROCerror:IFERR=17ENDPRDC
1880 *FX12,0
1890 *FX4,0
1900 MODE6:PRINT'':REPORT:PRINT" In
Line "ERL
```

BBC MICRO IN MANCHESTER

All prices include VAT unless otherwise stated

BBC Model B Computer	£399
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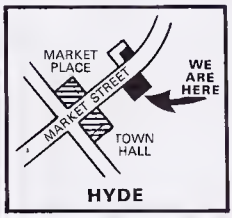

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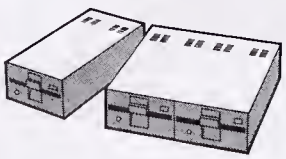

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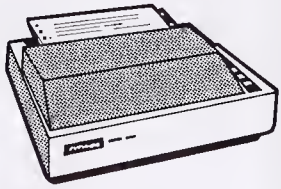

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C12 Computer Grede **CASSETTES** in library cases. **40p**

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(BBC Wordprocessor in 4K ROM)

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* Commands printed on Tablet and On-screen instructions.
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* Works with all operating systems and ECONET. Tape and Disc versions available.
* Large drawing area (32cms x 23cms).
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* Commands include line, circles and rectangle drawings, infilling, full editing and an easy to use copy and move feature.
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You don't need just any Eprom Programmer – you need **WATFORD ELECTRONICS** EPROM PROGRAMMER System.

★ Introductory Offer ★

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Price includes software in ROM and Manual)

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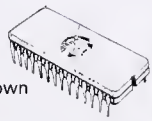

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by
Watford Electronics

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The extra features include:

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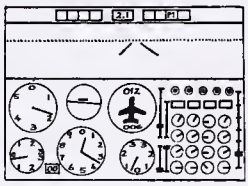

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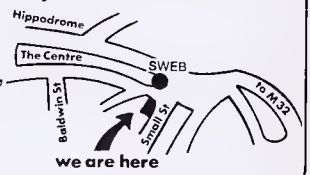

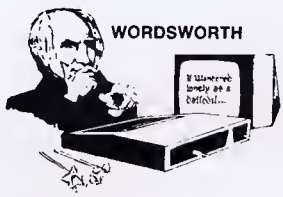

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MICROMAIL

Getting down to basic Basic instruction

THE last meaningful relationship I had with a computer was many years ago via rooms full of equipment like sorters, punch-cards etc. You can imagine my surprise at Christmas when a friend brought his Apple to stay for a few days.

I got hooked, read everything I could find on micros, and picked everybody's brains. At first I was going to get a ZX81, but of course I actually bought a BBC Model B last February.

I find however that as a complete novice, I am getting bogged down with bugs and printing errors.

The BBC manual is not exactly instructional in basic Basic. Your beginners articles on programming are good but I am getting inpatient. I cannot wait four weeks between each bit. Can you therefore recommend a good book? There are so many which look okay, it's hard to choose.

Considering how logical and accurate micros are, I am very surprised at the state of the printing in a lot of the books containing program listings. This apart from the printing errors, silly games (like draughts where the computer doesn't "take") and lack of instructions on how to actually play the games.

I was therefore very pleased to get your Deathwatch to work (am I supposed to have debris from blasted tanks littering my hillside?) and King Kong is nearly there.

Trouble is I keep getting "no room" when the scoreboard comes up. Any suggestions?

I have just started on Airstrike. What a shame you didn't print the table of variables and program structure this month, it was very helpful for de-bugging.

Thank you for being "reader friendly". – **Carol Lambert, Stapleford Abbotts, Essex.**

● Recommending a good book on the BBC Micro is rather like going out with a friend's sister – fraught with all sorts of complications! Having said that, we've always been adventurous in that respect (recommending books, that is) so here goes: "Easy Programming for the BBC Micro" by Eric Deeson is the one you want.

The thing with programs like Kong and Airstrike is that they take up a fiendish amount of room. Anything extra you add, perhaps inadvertently when using COPY, can cause problems. Our rather brutal recommendation is to leave out the instructions from the title page. This should give you plenty of room.

Yes, you are supposed to have debris, author Brian Clark swears . . .

Moving over to disc

EARLY this year I bought a model B BBC Micro and just recently I have invested in a single disc drive.

I now find that one of the jobs I intended to do is not as straightforward as I had hoped, namely transferring cassette-based programs which I had purchased on to a disc!

I have been a user of Commodore equipment for many years and when I progressed with this system to disc drives the transfer was easy, as no memory shift took place. I now find with the Beeb that cassettes locate at &E00 but discs at &1900.

I have a number of games programs and some I have managed to transfer (Chess, Swoop, Arcadians) but games from Acornsoft, for example Snapper and Monsters, have completely eluded me. I would have thought that the Acorn people who produce the computer would have allowed for compatability.

I am writing to you as I find your magazine for the BBC very helpful and interesting and as you specialise in the BBC machine I thought that you would be able to offer some help.

If you could assist in any way I (and my children who are used to the fast Pet disc facilities) would be very grateful. – **D.J. Fudge, Leicester.**

● Copying cassettes onto discs has caused our readers quite a few problems. I'm glad to say that we have got an article by Peter Walker on this subject in this issue. See Page 30.

If Peter's methods seem like too much hard work, Clares, who advertise in this issue, have a very clever program called Replica that does the job for you. I suggest you get in touch with them.

Plea for the robots

I THINK your magazine is the best on the market. I especially like the Beeb Body Building Course.

I undertook the BBC upgrade immediately and now have a fully operational model B. (I couldn't have done it without you!)

I am particularly interested in robotics, and when I heard about the BBC Buggy I was over the moon, though the price brought me down to earth.

I wonder if you would publish any articles about robots and interfacing things to the BBC? I have just mastered the user port and am now advancing towards the 1MHz bus.

I have one more question. Where can I get a pair of powerful (robot-style) stepper motors? I've tried everywhere. – **R. Champney, London.**

● It is good to know we have been of some help. We hope to cover a little of robotics later on in the magazine, but if you want to jump the gun you can get stepping motors from Chiltmeade. A stamped addressed envelope will bring you their list.

More on *LINE

*HERE are some more details of the OS commands *LINE and *CODE. They can be described as follows:*

**CODE x,y (x and y are decimal integers in the range 0 to 255).*

The specified values x and y are loaded into the X and Y registers respectively, and the accumulator is loaded with zero.

*An indirect jump is then performed to the address specified by USERV (located at &200) – the users routine should be located at this address, for example *CODE 23,250.*

**LINE s (s is a string of characters). The X and Y registers are loaded with the lo and hi bytes respectively of the address of the first character of s, and the accumulator is loaded with '1'.*

*Note that leading spaces are stripped off, for example *LINE*

MICROMAIL

From Page 105

Hook Line Sinker – NO quotation marks.

*To summarise, *LINE and *CODE call a user supplied routine whose address has previously been deposited in USERV.*

**CODE allows the user to specify the contents of the X and Y registers on entry. *LINE allows the routine to access a string of data.*

When a reset occurs USERV is set to point at &E310 which is the location of the "Bad Command" message, which is why the commands invoke this error until USERV is set up.

*The fact that *CODE and *LINE load the accumulator with 0 and 1 respectively is very important. It means that the user can write a routine to deal with both commands simply by testing the contents of the accumulator. If it contains zero then branch to the *CODE handling routine, otherwise continue with the *LINE handling routine.* – **Colin Browell, Sunderland.**

Advanced 3D games

I SAW a Saturday morning BBC TV programme which demonstrated the latest generation of TV games and their very advanced 3-D graphical representation of arcade games.

I would be interested to know what special hardware features these products have which permit them to do this.

Is it more memory, faster processors or the use of special languages? Will it be possible for future add-ons to the BBC Micro to allow similar 3-D games to be written? – **R.S. Tunbridge, Sittingbourne, Kent.**

● This system allowed a computer to access various tracks on a video disc, which could then show several sequences depending upon the user's input.

It is unlikely that this form of add-on would be available for the BBC Micro as a lot of work goes into creating the images on the video disc. It involves normal cartoon artists drawing the artwork in a similar way as the Walt Disney cartoons were drawn in the early '30s. This is a very labour intensive process and is a sort of step backwards in computer art.

The images are not actualiy created by the computer, the computer just controls the order in which you see the images.

In the foreseeable future that isn't really on in a home machine, but who knows what the next 10 years will bring?

No IC explosion

WITH reference to the Beeb Body Building Course in the May Micro User, no doubt I am the "Nth" person who has written to you on a rather destructive error in Figure I on page 38.

The analogue IC will not accept any greater voltage than 1.8v (IC73). The joystick circuit shows the "hot" end of the potentiometer taken to pin 1 (+5v), and should the slider travel anywhere near to this voltage either during adjustment or use the IC will surely blow.

I am sure that this is a typesetter's error and that I do not need to go to great lengths on the subject, but I note your Mr Cook takes the "fire button" to analogue earth. This was not the way Acorn had in mind – it can lead to intermittent operation due to hum loops in the earth return path.

The "fire" buttons should only be across pins 6 and 13 (CH0) or 3 and 10 (CH1). – **Peter Clappison, Hull.**

● I think you have misunderstood what was meant in my article, writes **Mike Cook.** There is in fact no typographical error in the diagram and the "hot" end of the potentiometer should go to +5v.

In my article I explained the reason for this is to increase the range over which the potentiometer will work. This is because in the joystick arrangement the mechanical movement is somewhat restricted and this arrangement affords a little amplification, albeit mechanical.

As to your concern about blowing the IC, do not be worried in the slightest. True that the **IC** will not accept any greater voltage than 1.8 but that is only for conversion, and any voltage greater than this will just show as the maximum possible value.

In fact according to the specification sheet for this device, which is a PD72002C, the input may be taken to a voltage 0.3 of a volt greater than the supply voltage on the chip without suffering any damage.

As the supply voltage on this chip is 5v, you can see there is no danger in taking this voltage up to 5v. In actual fact, the entire chip may be operated up to 7v without suffering any permanent damage.

As to the second part, it is true that the fire button is taken to the analogue earth but there is no difference between the analogue earth and the supply earth.

I think Acorn had it in mind when they designed the board

Interpreting the disassembler

AS I wished to learn something about assembler language, I bought your April Micro User tape. The only item on it that interested me was the Disassembler.

As Jim Notman gave the program for this, I thought it would help me to see how things worked if I instructed the computer to interpret the beginning of the Disassembler's own program.

The result made it fairly obvious that the interpretation was not correct.

As Mr Notman indicates in his article, the entries from E06 on are spelling out the name "Jim Notman", so in E06 ,4A is the Ascii number for J. However the tape interprets this as LSR A, which surely it has nothing to do with.

In line E0C the tape can make nothing of &74, which I take to be the "t" in Notman. Further down, E19 to E1D seem to be spelling out the date 1982 (not 1983 as in the magazine article), and again I imagine this has nothing to do with jumping to a subroutine, as the line with E19 suggests.

Your magazine claims to deal with the beginning of topics. It would be very helpful if an article such as Jim Notman's contained some sort of running commentary on the language used.

For instance, I notice &D0A, and later &D014,&D01E, with &A, &14,&1E meaning the decimal 10,20,30. Are these labels for the line numbers? If so, how do they tie in with instructions to OR the accumulator?

I would welcome some reassurance as to the validity of Disassembler in regard to the later parts of its own program, as I find a good way to learn a language (computer or otherwise) is to see how it deals with a known passage. – **W.W. Sawyer, Cambridge.**

● Jim Notman's very useful program contained both a disassembler and a hexadecimal dump, and you appear to have confused the two functions.

Both are to allow the user to look at RAM. The disassembler is to allow the user to investigate RAM that contains machine code routines. The hex dump is for decoding chunks of memory other than machine code, especially Ascii encoded bytes, such as the basic keyword tables and parts of programs.

Such memory is not meant to be interpreted as machine code, and to use the disassembler on them will, as you point out, produce garbage.

I think you'll find that our magazine does not claim to deal solely with the beginning of topics. There are a great number of capable programmers who have realised the excellence of the BBC Micro, and it is our policy to cater for them also.

Disassemblers and the like are not for beginners.

that the A to D converter was much more sensitive than it actually is, and no extra hum will be introduced by doing this that is discernible by the A to D converter, if in fact there is any extra hum at all.

This will not lead to intermittent operation – I have tried this over many months myself and have had no difficulties at all.

Getting into LDA

I'VE just read your March and April issues and was very impressed. Your magazine seems ideal for people like me who know nothing. The only comment I would make is that in your April issue Part Two of "How it works" you assume a vague knowledge of what LDA, STA, JSR etc. means. I don't know!

I can convert quite happily from denary to binary-hex, surely it would not have increased the length of the article too much? – **David W. Sills, Tabuk, Saudi Arabia.**

● I take your point, Mr Sills, but I'm afraid in this case it would have taken far more than just a few words to explain even vaguely what terms such as LDA, STA mean. Fear not though, we shall soon be starting our definitive series on machine code for the beginner.

Finding the function

A TIP – if you have programmed the function keys, and forgotten exactly what you put in them, type a line number higher than the highest line of your program, and press the function key – this will then appear on the screen, but not be actioned.

If the key definition contains more than one !M, instead of just the line number, type AUTO (line number) before pressing the function key. – **A.E. Wilmshurst, Crowborough, East Sussex.**

Spreading the light pen

TWO cheers for the Micro User! (Well , say 2¼.) Most of the contents are well worth reading. I find that you tend to assume that most of the BBC owners are new to computers.

Is this borne out by the facts? Surely most people who spend £300-£400 on a computer have some previous knowledge?

How about a light pen article in the Body Building Course?

Please do NOT list programs in Jim Notman's format. Is this just a way of filling more pages? – **I.R.L. Morom, Redditch.**

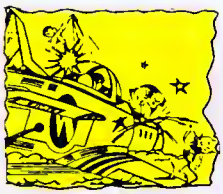
● The people who've bought BBC Micros seem to fall into two camps – those who know very little about computers and bought a BBC Micro because they were shrewd enough to spot a bargain when they saw it, or just took the magic letters "BBC" as a seal of approval.

And those who know an awful lot about computers and who know an excellent bargain when they see one. We have to cater for both! Spending £300-£400 is not immediate proof of computer knowledge.

The light pen article is coming up, though we cannot say when. Every time we see Mike Cook he's produced some new piece of electronic wizardry. At the moment he's working on a device to enable him to avoid editors . . .

As for Jim Notman's way of listing, it's a desperate attempt to try to staunch the number of calls for help that flood in from people who find listings very hard to type in.

We hope the new format will make things clearer for them. It's definitely not a ploy for filling more pages.



Missing PROCSTAR

I TYPED in the Space Pilot program in the June Micro User. I found it addictive and I was able to achieve high scores.

But after reaching around 10,000 and receiving PROC-NEWS I discovered that a procedure was missing :PROCSTAR. It says this in line 340, but has nowhere to go. I got an error message and lost my score.

Where is PROCSTAR? – **Kevin Robertson, Luton.**

● True, there isn't a PROCSTAR. What happened was that we asked the programmer to take it out of the program for various reasons. He got rid of all the references bar one, which you found. As you point out, it doesn't appear until you get a rather high score, and none of us here are that good.

All you have to do is to omit :PROCSTAR from line 340 and all will be well.

Colour clue

CAN you please help me? I have a BBC B Micro and I wish to have colour on the composite video output.

I have heard that the conversion is not difficult. The reason I need this is to put titles on video. I enclose a stamped addressed envelope for your reply, but perhaps the rest of your readers would also be interested in this upgrade. – **C.B. Geiser, Goodmayes, Essex.**

● You will have noticed that plugging the video output into a colour monitor does not result in a colour picture. This is because the colour burst signal has been omitted from this output. Goodness knows why, because it is quite simple to put back.

All you need to do is to connect a 56 picofarad capacitor between R123 and Q9. You should carefully solder one end of the capacitor to the resistor and put a piece of insulation sleeving over the other and take it to the emitter of the transistor. This will then put the appropriate burst signal into the video.

The video output will then be a fully composite PAL encoded output and it will then be possible to connect it to a colour monitor. However we hear that Acorn do not authorise this, so if you are in any doubt at all, please take it to your dealer who might be kind enough to do this modification for you – at a price.

Unsnipped links 1

I HAVE a model A machine which I have upgraded to B specification following your Body Building Course. I have inserted chip 74LS163 (IC76) but have not as yet snipped links S12 and S13 as your article in the March edition implied that this was not necessary until further ROM expansion was required.

I was somewhat disturbed when a colleague, who has done a similar expansion, pointed out that in a similar article in another magazine, it stated that these links must be cut before the machine is used again.

Is this correct? If so, what damage am I likely to have done to my machine? So far (one month later) no detrimental effects have shown themselves.

May I add my name to the growing list of those singing the

MICROMAIL

From Page 106

praises of your magazine. I like your style – keep it up. – **D. Simpson, Sherburn-in-Elmet, Yorks.**

● Do not worry about not having snipped links S12 and S13 as this will not damage the machine.

Contrary to what has been said in other magazines, the only thing that could possibly go wrong is that IC76, that is the 74LS163, could possibly have been damaged.

However, this is very unlikely as these devices are made to withstand a permanent short circuit to earth on their outputs so that there is little danger of them becoming damaged.

Some people are a little paranoid about shorting outputs.

Unsnipped links 2

I HAVE bought the Wordwise chip and 1.2 ROM supplied by Computer Concepts. My computer is the BBC Model B.

*The 1.2 chip has been inserted correctly and responds to the *FX0 command with the screen message OS 1.20.*

When the Basic ROM is transferred to one of the sockets C, D or E it does not work. The screen display when switched on is "Language?". Return the Basic ROM to socket B and the computer works again.

Inserting Wordwise in socket B operates Wordwise but does not transfer to the Basic ROM when requested. Wordwise does not operate in sockets C, D or E.

IC76 was supplied with the machine. Links S18 and S33 are correct and have been checked several times. My dealer is unable to solve the problem. – **??, Thurso, Caithness.**

● Thank you for your letter. Unfortunately I am unable to translate your signature so for the moment you remain an anonymous Micro User!

We think your problem is that links S12 and S13 have not been cut. These are by the plug that connects the keyboard to the main computer board.

Just snip them open with a pair of tin snips and this will enable the sideways ROM sockets to work. You can then have Wordwise or any other language in the machine.

Hong Kong phooey

ISSUE Number 4 of The Micro User implied that all BBC Micros are manufactured in Hong Kong.

In fact, all machines sold in the UK have been manufactured in the UK and machines monufactured in Hong Kong will NOT be sold in the UK.

Would you please be kind enough to correct any misunderstanding which could well have occurred, at the earliest opportunity.

At the some time, you may care to correct the misprint on Page 4 since it was the hundred thousandth machine which was presented to Charing Cross Hospital. – **Colin Malone, BBC Enterprises.**

● We have never stated that all BBC Micros are made in Hong Kong. The first issue of *Micro User* very clearly pointed out that machines sold in the UK and the rest of Europe were built in Britain, and that the Hong Kong production line was primarily to supply BBC Micros to Far Eastern and Australasian markets.

Services rendered

THANK you for a smashing publication. Thank you for those value-for-money tapes. Thank you for your good service. (I ought to set this to music!)

I relax, after spending hours typing in a program and then find a comma, bracket, a space where there should or should not be one, etc . . . even find a B when it should have been 8.

I then run one of your tape games in and amuse myself.

So satisfied am I with your tapes, I have joined your 12 month tape offer. Keep up the good work.

By the way, I wonder if you could put a cracker under the tail of Acornsoft, who would do very well to take an example of service from you.

They do not seem to have much interest in the small customer except to get hold of our money.

I placed an order for three tapes mid February, I received two in fair time, but had to return one faulty, still waiting for a replacement, and for one of the original order.

It would not be so bad, but you can see the same or similar for sale elsewhere. BBC Micro User has no difficulty in delivering new progroms each month.

Acornsoft, who have been spending a fortune on advertising their tapes for months, months and months cannot deliver in a reasonable time, ond with the facilities available to them. They should wake up or let someone else take over. – **J. Porter, Denaby Main, Doncaster.**

Still going wrong

AFTER all the problems of delivery of the BBC Micro, and the cassette bugs (which Acorn refused to take proper responsibility for) and the chaos regarding price/availability of new ROMs, things are still going wrong.

Acorn have been extremely difficult to get hold of on the phone, and they don't seem to reply to letters.

And now we have new versions of chips, which may not run your old programs.

Of course clearing up bugs can bring improvements, but not if they introduce others in their place, as has happened in relation to VDU1, so that the Acorn technical person I spoke to said it was probobly not possible to write a common print-on-printer-only routine to work on 0.1, 1.0 and 1.2 OSs.

The Basic II chip is not upward compatible from the old Basic. (@%=10:PRINT STR$(67.8) gives different results which may upset formatting. The fact that this may be overcome by doing it a different way is irrelevent, since programs written in the old Basic didn't know they would need to do that.)

Yet, rather than warn people of this, they quietly introduce it into new machines, while denying it existed (BBC Micro User, Morch, Page 9) and later claiming it "wasn't different, but was tronsparent" (BBC Micro User April, Page 9).

Changes to existing facilities affect the credibility of not only software, but also of hardware attachments, which may have been manufactured without knowledge of what would be changed in the future.

As an example, the Amber 2400 printer will not work properly using the serial interface on the 1.2 OS.

And now – although they cannot offer adequate support to the home market – they are about to launch the micro on the unsuspecting European and American markets, trading on the good name of the BBC.

The BBC does not seem to want to have anything to do with the woy things have turned out, though I would have thought they had something to lose in the USA if the reputation of the BBC is tarnished. – **Kenneth Morey, London.**

Snags on supply

WHEN is Acorn going to stop mucking us about?

I paid out £399 to buy a much advertised product, the BBC Micro. After a fairly long

● Want to write to Micromail? The address is: Micromail, The Micro User, Europa House, 68 Chester Road, Hazel Grove, Stockport SK7 5NY.

wait the machine arrived.

Soon the euphoria of a new "toy" wore off and the frustrations of the operating system bugs set in.

The tape unit would not record reliably because of the fault in the OS ROM. I deliberotely do not call it euphemistically a "bug" – it is a fault.

As you become more familiar with the handbook it becomes obvious that not only will the cassette system not work reliobly but it is impossible to access the ROM sockets under the keyboard from the existing 0.1 OS.

And I fail to see how the ROM socket next to the keyboard can be used for "games ROMs" as advertised. As it is connected it can only be used for ROMs accessed by the speech synthesiser.

I have tried by various means to obtain a new OS, no way! I am always told they are not available yet, but if I buy any Acorn add-on that needs the new ROM they are supplied with it.

Who is Acorn kidding? It appears to me to be a deliberate ploy by them to ensure that only Acorn add-ons will sell and eventually all the others will fall by the wayside.

This will impede the advoncement of what must surely be the best micro on the market at the moment.

Come on Acorn, let's have some answers. Get the marketing up to the same stondards as the machine. – **R.I. Elliott, Bristol.**

● I am surprised that you haven't been able to get an 1.2 OS for your upgrade – they seem to be readily available.

Nor, knowing Acorn as I do, can I accept that it's a "deliberate ploy" to push their own products. If there is a shortage of the necessary ROMs, it's probably only temporary.

Hopefully you'll be fixed up soon.

Memory shortage

THANK you for the two corrected lines for the King Kong program, given in the May issue of The Micro User.

However I also had to alter line 420 to include Y%, this move X%, Y% – 15: Draw X% – 180, Y% – 15: etc. to get the firing correct on the right side of the screen.

With the King Kong and the Deathwatch programs I find that using the listings given and loading from tape I can only run the program once, enter one nome and then I get "No Room" (I have a 32k 0.1 EPROM).

Are other people getting this problem, or do I have an error in the computer?

I have modified the instructions to King Kong, taking out approximately one paragraph, and they are still clear enough to operate the program and this now enables it to run through.

With Death Watch I have removed the REM statements and taken out some spaces, and can now get nine names before the "No Room" sign.

Your comments on this would be oppreciated.

In programs such as "Van Gogh", "Graphics", etc. where problems are set, do you think guides (not in full) could be given to the solutions in the next issue? **J.E. Pearson, Coventry.**

● Thanks so much for your letter. You are quite right about line 420 – one we missed!

Deathwatch and King Kong both use a great deal of memory. If you "tidied it up" or added extra spaces, so easily done with the copy key, you'll run into memory problems.

So far we haven't had any demands for solutions to our little tests, so we haven't published any. Of course we'd reconsider if we had more requests for them.

And finally, with tongue firmly in cheek . . .

Missive from a faint-hearted micro user

Dear Trev,

Forgive me, for I have sinned. I didn't know I was sinning at the time, but that's no excuse. I have fallen from the path of virtue and I freely admit it.

I only found out the error of my ways when Clive, who's one of the regulars at my local (The Ram ond Buffer), mentioned that he had a BBC Micro. I would have kept quiet about mine but, of course, Andrea had to open her mouth.

"Oh Bob's got one of those in the spare bedroom. He goes up and leers over it for hours every night."

So my secret was out. Myself, I'd decided not to admit to having a Beeb until I'd worked my way through the User Guide. Incidentally you were right, ENVELOPE did give me a lot of problems, but now I think I've got it licked. (Sorry!)

To cut a long story short, after a few more drinks I ended up inviting Clive round to my place the next evening to have a look at my "software".

Andreo was particulorly obnoxious all the next day. She kept on about how nice it was that I had a "little friend" and that I'd started to share my "toys". Even before he arrived she'd spoilt Clive's visit for me, but he made it even worse.

To impress him I showed him my masterpiece, a program that keeps a record of the household accounts, and when we go into the red prints a reasonably accurate picture of my bank manager with the message "Cut down on expenses, get rid of Andrea."

Clive said "Interesting", typed in LIST and all my sins were exposed.

"Good grief", he yelled, "you've used a GOTO, you've actually used a GOTO."

I was as horrified as he was but for different reasons. What had I done wrong? What was so bad about GOTO and if it was so awful why wos it in the User Guide?

Meanwhile Clive carried on with his demolition of the program (and my pride).

"Not a GOSUB. I don't believe it. Why not use a procedure? You've got a BBC Micro, not a Plectrum. Use it, don't abuse it."

He proceeded to give me a lecture on good programming (which made me feel like I'd been caught doing unspeakable things in the potting shed).

I didn't understand it all but apparently just because it's in the books doesn't mean you can use it in public. Which reminds me of something else, but I can't think what.

He pointed out that my BBC Micro had upper case and lower case characters and why didn't I use them? I told him that A. was too middle class to allow me to use the lower case, but he wosn't amused.

"Structure, thot's what you need, structure". Somehow he made it sound like lack of moral fibre.

He left shaking his head and reminding me that programs had to be intelligible to other people. "User friendly" was the term he used, which was a bit much as he wasn't very friendly to this user!

Anyway, his programs may be lucidity incarnate to others but mine won't because no one's ever going to see a listing of mine again.

Yours in adversity,

Bob

P.S. Rumour has it that Clive has recently been before his local user group's disciplinary committee for not declaring his variables in a listing. Apparently he has been ordered to use a Plectrum for a month, suspended for a year.

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Andrew Whyte & Son	75	Level 9	92
Anthony Ashpitel	75		
ASD	78	M.P. Software	62
		Merlin Computer	52
B S Dollemore	110	Micro Management	76, 77
Beeprint	65	Micro Spares	74
Bitabyte	95	Micro-Aid	84
Bourne Educational	83	Microadvent	34
		Micromode	86
C-Tech	99	Micropower	112
CCE Europe	104	Microwere	104
Chalksoft	62	Midwich	37
Challenge Games	75	Multiplex Computer Services	95
Clares	23	Musicsoft	34
Computer City	111		
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D.R.G.	53	Pslon	7
Datatech	100		
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Digitel Fantasia	50		
Doctor Soft	65	R. Upfield	84
		Ricksoft	52
E.C.L. Software	84		
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Elektronequip	20	Sepphire Softwere	84
Eltec Computers	47	Silent Computers	34
		Silicon Centre	74
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		Simonsoft	92
Gaelsett	62	Skyleader	86
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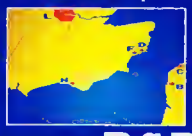

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